NASA News

National Aeronautics and
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Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

Peter W. Waller 415/694-5091
Linda Blum

For Release:

Immediate

Release No. 86-10

NOTE TO EDITORS

NASA's Pioneer-Venus spacecraft has completed five weeks of its seven weeks of observations of Halley's comet.

These are the only close-up observations of the comet during its closest approach to the Sun (perihelion)--its period of greatest activity. Pioneer is the only U.S. spacecraft in the neighborhood of the comet on its pass through the solar system, when Halley's, Venus and Pioneer are all on the other side of the Sun from the Earth.

Pioneer has made an image of the comet, which shows, for the first time, the coma, the 12-million-mile-diameter cloud of gas surrounding the comet nucleus. The coma is 12 times larger than the comet as seen in visible light.

A media briefing to describe Halley's results to date will be held at NASA-Ames on Wednesday, February 26 at 10 a.m. The image of Halley's coma will be released at that time. Release of the image has been delayed because of data distortion produced by a major flare on the Sun, as well as limited staff to work on science and image enhancement.

Briefing participants are: Dr. Ian Stewart, University of Colorado, principal investigator; Dr. Jeffrey N. Cuzzi, NASA-Ames; and Richard Fimmel, Pioneer Project Manager.

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Pioneer's data is received at the Pioneer Mission Operations Center at NASA's Ames Research Center. Observations will continue until March 6, when close flybys of the comet by European, Soviet and Japanese spacecraft begin.

The Pioneer Control Center will be open to press after the briefing, and the ultraviolet image of the comet will be visible on television monitors. Videotape animation of the comet nucleus and the mission, and still photos will also be available. News reporters planning to attend should come to the NASA gate of Moffett Field, and will be directed from there.

February 21, 1986

NASA News

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Ames Research Center
Moffett Field California 94035
AC 415 694-5091

Donald G. James
415/694-5091

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GOOD SLEEP STRATEGY MAY REDUCE PILOT FATIGUE ON LONG-HAUL LAY-OVER FLIGHTS

Flight crews could substantially reduce the effects of jet lag after flying long distances eastward by not going to sleep immediately after arriving, according to a study released today by an international group of scientists, physicians and airline personnel.

This study, coordinated by NASA's Ames Research Center, Moffett Field, Calif., was supported by scientists from the Institute for Aerospace Medicine in Cologne, W. Germany, the Royal Air Force Institute of Aviation Medicine in Farnborough, England, the Civil Aviation Authority in London, the Japan Air Lines Flight Crew Medical Service in Tokyo, and the Stanford University School of Medicine in California.

According to data compiled by NASA's Aviation Safety Reporting System - a system set up to receive anonymous reports from flight crews on air traffic incidents - there have been 261 reports, between July 1980 and August 1984, that listed fatique as a contributing factor to the incident.

In 1983 the United Kingdom established a similar reporting system and in its first 18 months of operation received 52 reports citing problems of fatigue.

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Foregoing or minimizing sleep right after arrival and extending the subsequent awake period during the local day, helps to ensure that the night sleep will be nearer to normal duration. The findings suggest that by using this sleep strategy the poor sleep which normally occurs should be minimized, thereby reducing sleepiness during the subsequent long return flight.

Scientists continue to analyze the data to understand the effects of other variables, including age and personality characteristics on layover sleep quality.

The researchers, with the support and cooperation of four international airlines and their flight crews -- British Airways, Japan Air Lines, Lufthansa, and Pan American World Airways -- took objective and subjective measures of sleep quantity and quality. The data were obtained from volunteer pilots and flight engineers who flew trips across 7 to 8 time zones between their home bases and Tokyo, San Francisco, London, and Frankfurt.

Instead of spending their layover nights in hotels, flight crews went to specially equipped sleep laboratories in the destination cities. Scientists placed electrodes on the crews to record brain activity. They also measured sleep and waking patterns. From the data the scientists determined the crews' quality and quantity of sleep, their sleepiness the following day, and their sleepiness prior to reporting for duty to fly.

The scientists used the data to determine the relative effectiveness of different "sleep strategies" such as napping or sleeping according to home time, e.g. California time, instead of local time, e.g. London time assuming a San Francisco to London flight.

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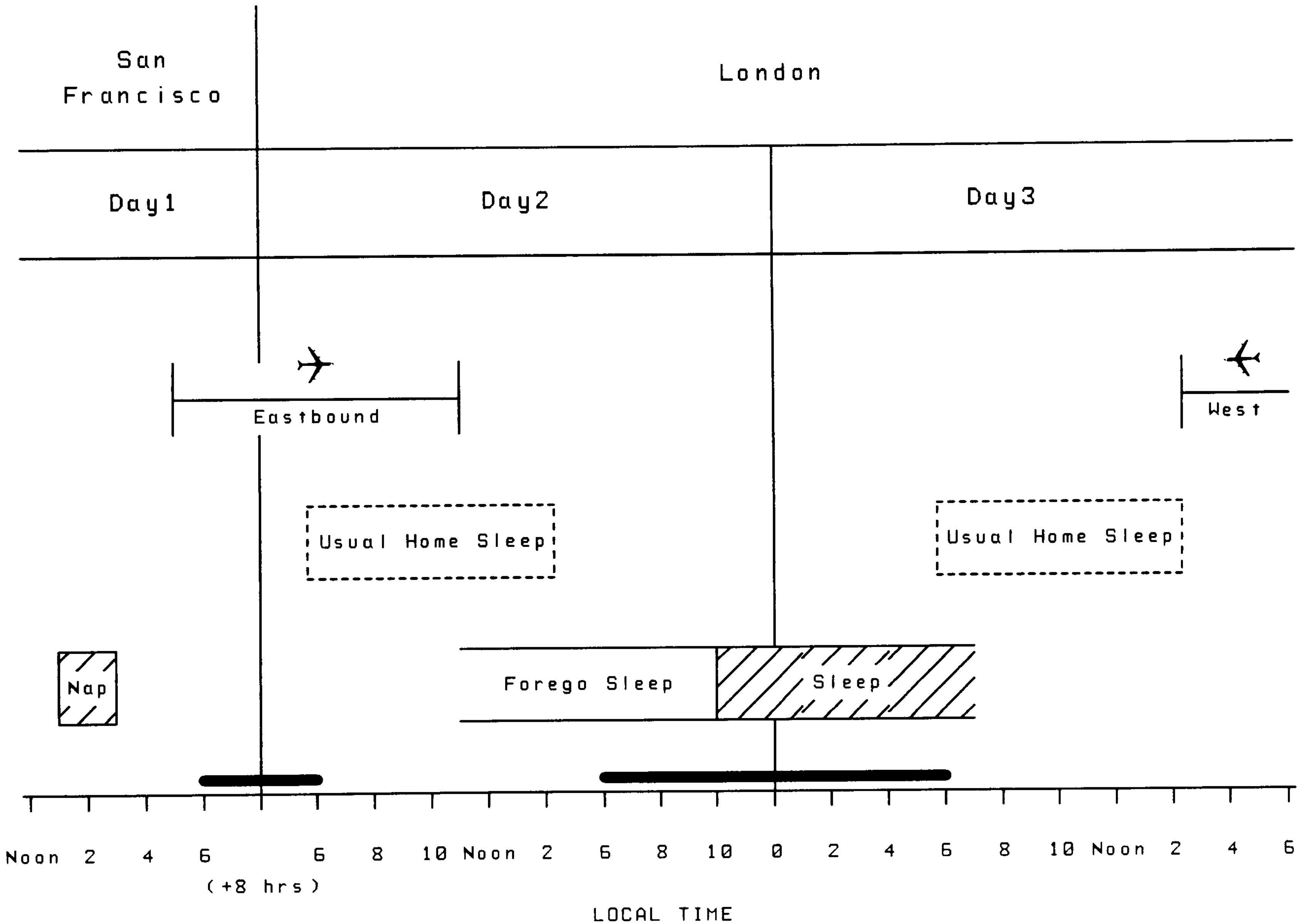
JET LAG SLEEP STRATEGY



While most of the 56 volunteers obtained adequate sleep, researchers noted major differences in sleep quality between westward and eastward flights, an effect that is well-known to many long distance travelers. Following westward flights, crew members clearly experienced less difficulty obtaining sleep during layovers compared with eastward flights. In fact, following westward flights, most subjects fell asleep faster, reported better quality sleep, and slept as long as they did when "baseline" sleep recordings were taken in their home cities.

Sleep patterns were more variable and fragmented after eastward flights than after westward flights across an equivalent number of time zones. Flight crews often broke up one long sleep period into two or more sleep periods. The poor quality of this sleep was reflected in increased levels of day time sleepiness the following day.

Most crew members took naps in the afternoon prior to reporting for duty for the return flight -- a strategy which appears to prepare them well for the upcoming eastward night flight.

This study was limited to examining sleep quality during initial layovers. Follow-on studies are planned to extend the findings to multiple layover flight schedules typically flown by international flight crews.

# # #

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Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

Debra J. Rahn
Headquarters, Washington, D.C.
(Phone: 202/453-2754)

Donald G. James
Ames Research Center, Mountain View, Calif.
(Phone: 415/694-5091)

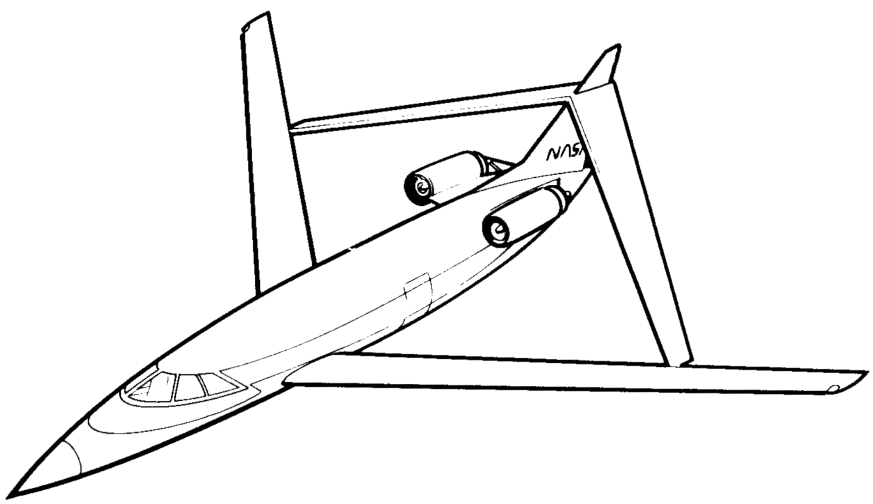
For Release:
April 8, 1986

RELEASE: 86-18

NASA TO EVALUATE JOINED WING CONCEPT WITH SMALL BUSINESS FIRM

NASA's Ames Research Center, Mountain View, Calif., has entered into a Small Business Innovation Research contract with ACA Industries, Palos Verdes, Calif., to build the advanced concept joined wing, NASA announced today. Initial flight tests are planned by ACA Industries for early 1988 at Mojave, Calif. The estimated value of this 2-year contract is $500,000.

The joined wing is an advanced aircraft design incorporating a swept-back main wing that is joined, close to its wing tips, to a swept-forward rear wing.



Stronger aircraft structures and increased fuel efficiency are the primary benefits anticipated.

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The purpose of the program, declared NASA's Dr. David J. Peake, Chief, Advanced Aerodynamics Concepts Branch at Ames and Robert Baron, Project Office, Ames-Dryden Flight Research Facility, Edwards, Calif., is to build, ground certify and flight test a joined-wing research/flight demonstrator aircraft.

There are three main research objectives:

* Demonstrate the proof-of-concept for joined wings;

* Demonstrate that the low-speed flight handling qualities of the joined-wing research/flight demonstrator are satisfactory; and

* Compare flight test data with results from current aerodynamic and computational methods developed especially for joined-wing aircraft.

The research flights will take place at Mojave Airport using an existing aircraft that will be substantially modified. ACA Industries will convert the NASA AD-1 aircraft, currently out fitted with the scissor-like "oblique-wing," to a joined wing configuration. Converting the AD-1 is expected to take 13 months. Data from the demonstration will be compared with data received from computational analyses and wind tunnel tests conducted with a joined-wing model.

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Ames Research Center
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AC 415 694-5091

Peter W. Waller 415/694-5091

For Release:

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Release No. 86-19

NASA AWARDS TECHNICAL INTEGRATION CONTRACT FOR NAS PROGRAM

NASA's Ames Research Center, Mountain View, Calif., has awarded General Electric Company, Space System Division, Sunnyvale, Calif., a contract modification for technical integration and support services. The work will be performed on a cost-plus-award-fee basis for the Numerical Aerodynamic Simulation (NAS) program.

The estimated value of this 28-month modification is approximately $19 million. Total value of General Electric Company's 5-year contract is estimated to be $29 million. The modification is an extension of services presently being performed at the Ames Research Center.

General Electric Company will provide the necessary management, personnel, equipment and facilities required to accomplish the technical integration of the separate elements of the NAS program into an operational capability.

NASA's NAS program is planned to provide the world's most powerful large-scale, high speed processor system. In addition to its important advantages for aircraft design, NAS represents a major national facility in such research areas as aerothermodynamics, computational chemistry, atmospheric modeling and other computationally intensive scientific applications.

April 15, 1986

NASA News

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Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

C.J. Fenrick 415/694-5091

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Release No. 86-23

NASA AMES SELECTS SUPPORT SERVICE CONTRACTOR

NASA has selected Bamsi, Inc., Titusville, Fla., for final negotiations leading to the award of a 5-year support services contract, effective July 1, 1986. As a competitively negotiated procurement, the first 3 years of the contract has a proposed value of $9 million.

Bamsi, Inc. will provide on-site maintenance support services and incidental construction at Ames Research Center, Mountain View, Calif. This contract will provide personnel, material, equipment and other resources necessary to perform maintenance services in the following general areas: electrical services, mechanical services, plumbing, pipe-fitting and utility services, building trades service, and heating, air conditioning, environmental and refrigeration systems services.

# # #

June 3, 1986

NASA News

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Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

C.J. Fenrick 415/694-5091

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Release No. 86-24

AMES RESEARCH SCIENTIST DISCOVERY
SETS AGENCY "SPINOFF" RECORD

A NASA-Ames research scientist has discovered a revolutionary chemical process for the making of sunglass lenses. His invention, utilized by a major sunglass manufacturer, has produced sales approaching $100 million. The new lenses will stand up under normal wear five times longer than conventional plastic lenses. The new technology holds the NASA record for the most units made and sold under a NASA license and is second in highest royalties to NASA. It is projected that, within the next two years, NASA will realize its highest royalty return from this invention.

Theodore J. Wydeven, Jr., Ph.D., a physical chemist at Ames Research Center, Mountain View, Calif., discovered the process while working on another problem. Wydeven had a need to improve the thin semi-permeable membranes of a spacecraft water purification process. One of the best ways to do this was to coat a porous filter with a thin plastic semi-permeable film, using an electric discharge of an organic vapor.

Wydeven's lost-cost process of depositing a thin plastic coating upon another dissimilar plastic sheet appeared to have practical applications. As a result, his process was a key, according to experts in the field, to resolving other problems. The sunglass manufacturers had such a problem.

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In the eyeglass industry, ground and polished tempered glass has been the traditional and ideal lens. However, in recent years, the many virtues of polarized and other plastic lenses have been explored. Plastic lenses have excellent optics and better absorption of dangerous ultraviolet radiation. In addition, they are resistant to shattering, easy to shape, lightweight and more comfortable to wear than glass. But the major problem with plastic lenses is their susceptibility to scratching. After a few wipes and a few wearings of sunglasses with plastic lenses, a haze of fine scratches may appear which greatly reduces visibility.

A similar problem also exists with plastic space helmet visors. Through his research, Wydeven discovered an abrasion resistant coating and process for polycarbonate visors, and this is when one sunglass maker became more than interested in the scientist's invention.

One of the world's largest manufacturers of non-prescription sunglasses, Foster Grant Corporation, Leominster, Mass., obtained a NASA license to use the Wydeven process in 1983. Under the license, this manufacturer has used the process to coat over five million pairs of sunglasses in less than three years, according to a company official. These sunglasses are sold under the trade name of "Space-Tech" and have generated approximately $75,000,000 in retail sales. The Space-Tech sunglasses are available at most local retail outlets at the relatively low price of about $15.00.

The coating process used is referred to as glow discharge or plasma polymerization. The compounds utilized in the procedure process are organosilanes which are plasma polymerized and then treated for a short time with an oxygen glow discharge to increase hardness or scratch resistance.

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NOTE: A photograph of Dr. Theodore Wydeven, Jr. looking through a pair of the new type of sunglasses is available to media representatives, from Ame- Research Center.

June 30, 1986

NASA News

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Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

Peter Waller 415/694-5091
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For Release:

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Release No. 86-25

SPACE SICKNESS STUDIES BEGIN

Scientists at NASA's Ames Research Center, Mountain View, Calif., will begin a new series of studies to determine, more precisely than ever before, what physiological changes occur when motion sickness is encountered in space.

About fifty percent of all astronauts have experienced space motion sickness and have shown symptoms such as nausea, sweating or dizziness during past missions.

Ames scientists will measure a range of physical reactions, in motion environments, to find out whether people who are highly susceptible to motion sickness have different fundamental physiological responses than those who are highly resistant to it. If so, the results can be used to develop more effective and successful physiological training of astronauts to avoid motion sickness.

Volunteers will be subjected to three types of tests, the first of which establishes a baseline. Here, individuals are asked to relax while normal physiological levels are determined.

The second phase involves minor stimuli which are designed to affect the cardiovascular system. Examples would be taking a breath and holding it, sticking a foot in ice water or performing mental arithmetic.

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And, lastly, there is the actual motion sickness experiment. Participants are placed in a chair bolted to the floor of a rotating room and they have control to stop the test at any time before becoming sick.

The program is the first in a series to use sophisticated equipment which looks at the underlying psychophysiological causes of motion sickness.

In the past, such data collection has been limited to information such as heart rate, respiration and temperature. But using advanced technology, which includes impedance cardiography and transcutaneous detection of carbon dioxide in the blood, more precise measurements can be calculated. Examples would be how hard the heart contracts, how much blood is pumped out with each beat and how effectively oxygen is used by the body.

Results of the program will be used in subsequent studies to train astronauts to better control the symptoms of space motion sickness. Research has shown that drugs are generally not completely effective in this area. As a result, Autogenic Feedback Training, which combines attention training and biofeedback, will be used to control the symptoms. Biofeedback is a process which relays information about biological responses back to the subject.

The study will be conducted at NASA's Ames Research Center from mid-August through October. Volunteers will be required to come in three or four times for a few hours and will be paid for their services.

Project managers are looking for at least 20 men and women between the ages of 18 and 55 who are either highly susceptible or highly resistant to motion sickness.

Persons in relatively good health who are interested in assisting the space program should contact Gail Bennett-Hiley or Ranita Dalton at 415/969-8347 or 415/694-5118.

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July 14, 1986

NASA News

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Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

Peter W. Waller 415/694-5091

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For Release:
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Release No. 86-27

NASA SUPERCOMPUTER SYSTEM TO
BECOME AVAILABLE NATIONALLY

The world's most powerful supercomputer facility, the Numerical Aerodynamic Simulation (NAS) system, will go on-line to scientists and engineers throughout the country on July 21, 1986.

With the new system, more than 150 scientists from NASA centers, the Department of Defense (DOD), universities and industry will begin running research projects on the NAS supercomputer system located at NASA's Ames Research Center, Mountain View, California. The NAS supercomputer complex will be linked with 27 remote locations across the country through a combination of high-speed terrestrial and satellite links.

For example the new NAS networks will give a scientist at Colorado State University direct access to the world's most

-more-

powerful computer system via his personal computer. He can run complex programs using the full capabilities of the NAS system including its unique color graphic displays, located about 1,000 miles away.

Scientists in Massachusetts will use NAS for joint work with scientists in Long Island. Scientists at Ames will work jointly with university scientists in Colorado and Maryland.

The NAS system is chartered to progressively incorporate the world's most advanced supercomputer technology into the NAS facility and serve as a pathfinder in supercomputing for government, universities and industry. Work on the NAS system began at Ames in the mid-1970s. Last September, the CRAY-2 supercomputer was installed as the main computational engine. The NAS CRAY-2 is unique in having a 256-million-word memory (largest yet available) and can perform 250 million computations a second.

Ames expects to select the next generation super-fast computer, currently referred to as the HSP-2 (High Speed Processor-2), within the next year. This machine is expected to perform a billion computations a second. This will bring the NAS system closer to its near-term goal of having computers with a billion word memory and computational power of 4 billion calculations a second. A longer term goal is to have a 10 billion computations-a-second capability within a decade.

Start-up of the NAS national network involved a selection

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process which resulted in the choosing of 97 research projects to use the NAS resources. The majority of these projects focus on aerodynamics and hypersonic flight research. NAS will be one of the prime national centers involved in development of the NASA/DOD National Aero-Space Plane. Other NAS projects will include astrophysics, computational chemistry, weather modeling and other large-scale computation problems.

Scientists and engineers located nationwide will interact with the NAS system's CRAY-2 and supporting processors, such as the Amdahl 5840s and VAX 11/780s, by using a NAS-developed operating system called VINOS (Vendor Independent Network Operating System) that is based on the UNIX system. The VINOS operating system will allow scientists to use their own color graphic displays to interact with the CRAY-2.

The NAS system will be relocated to a new computational facility in late 1986 and will be fully operational in March 1987 when it will almost double the number of scientists and engineers using the system.

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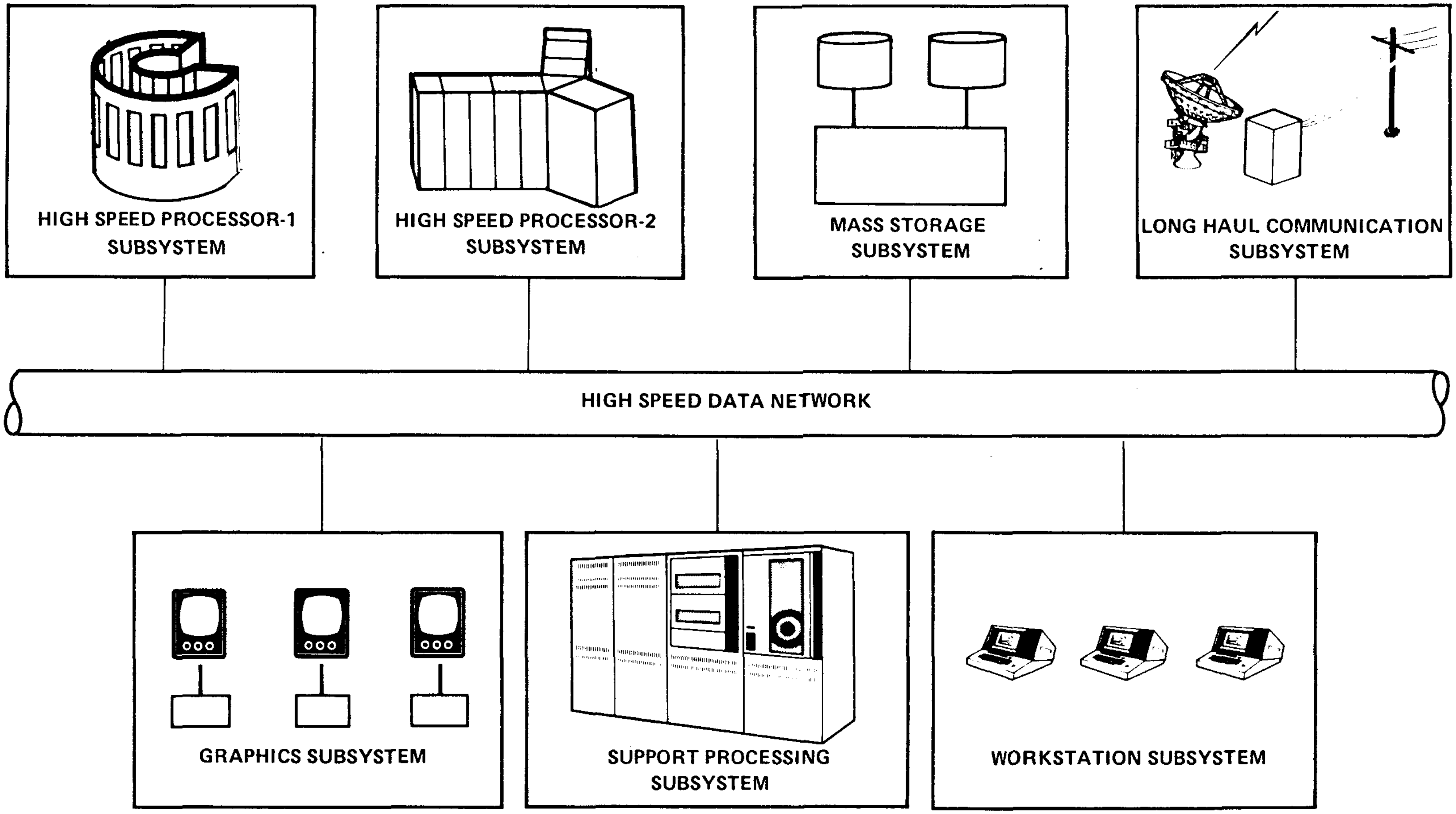
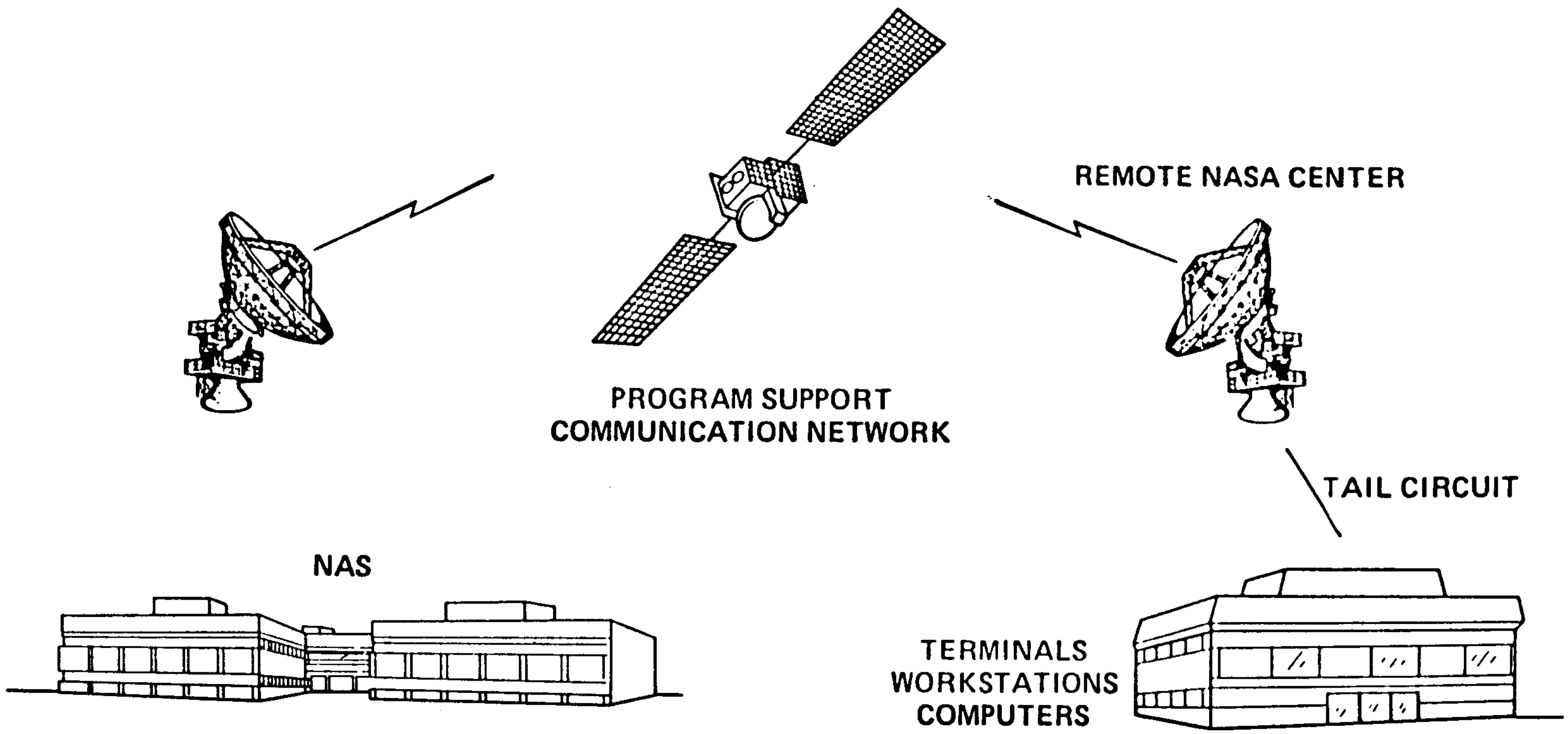
July 16, 1986


HIGH SPEED PROCESSOR-1 SUBSYSTEM
HIGH SPEED PROCESSOR-2 SUBSYSTEM
MASS STORAGE SUBSYSTEM
LONG HAUL COMMUNICATION SUBSYSTEM
HIGH SPEED DATA NETWORK
GRAPHICS SUBSYSTEM
SUPPORT PROCESSING SUBSYSTEM
WORKSTATION SUBSYSTEM

NAS REMOTE ACCESS NETWORK



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National Aeronautics and Space Administration

Ames Research Center
Moffett Field, California 94035
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For Release:

Peter Waller 415-694-5091
Linda Blum

IMMEDIATE

Release No. 86-30

POSSIBILITY OF LIFE IN ANCIENT MARTIAN

LAKES SUGGESTED BY ANTARCTIC LAKE RESEARCH

Ice-covered lakes on ancient Mars could have provided a medium capable of supporting the evolution of life, NASA scientists say.

Lakes which are thought to have pooled in canyons on early Mars could have been rich in essential gases and remained liquid and relatively warm despite sub-freezing air temperatures, research suggests.

NASA researchers have intensively studied similar, ice-covered Antarctic lakes for applications to these Martain lakes.

A surprising, complex ablation process which keeps the Antarctic lakes relatively warm could also have trapped heat and concentrated dissolved gases in the Martian lakes, according to astrophysicist Christopher McKay and biologist Robert Wharton of

NASA's Ames Research Center in Mountain View.

Viking photographs indicate that huge lakes formed in the Valles Marineris, a 3,000-mile-long canyon system near the Martian equator, during the first billion years of the planet's history. Layered sediments from the canyon floors, photographed by the Viking space probes, appear flat-lying and constant in thickness over large areas, suggesting that they were laid down in liquid water. "It's an almost inescapable conclusion," says planetary geologist Michael Carr, of the U.S. Geological Survey.

These sediments provide the only evidence for standing bodies of water on Mars. (There is much evidence for flowing water on the Martian surface in dry channels resembling riverbeds.) The Antarctic research could explain why the canyon lakes were not frozen solid -- how the water could have remained liquid beneath an ice cover -- on early Mars. While early Mars is believed to have been warmer than the planet is today, it would still have been below freezing, scientists believe.

Since liquid water is thought to be a precondition for life, protected enclaves as the Valles Marineris lakes may have been the most promising places for life to have evolved on Mars.

These lakes would be a "very exciting possibility for the early development of life on Mars," says Harold Klein, chief of life detection for the Viking Mars missions.

"It's quite conceivable there are microfossils in the (lakebed) sediments," McKay says.

Most scientists believe that life would evolve most readily in a warm, clement environment, as on early Earth.

However, McKay points out that pre-biological molecules, the complex organic compounds necessary to form life, are more stable at cooler temperatures.

"Perhaps it was easier for life to generate on Mars," McKay speculates.

If life ever did generate on Mars, it would probably have been destroyed billions of years ago, when Mars cooled and lost much of its atmosphere, according to McKay. "It's highly unlikely life could exist on Mars today," McKay says.

The Antartic lakes studied by the NASA group are found in a frigid, arid environment, resembling conditions which may prevailed on early Mars. The Antarctic lakes are "the closest analog on Earth to the Martian paleolakes," says Steven Squyres of Cornell University, who has studied the Viking images of the canyon sediments.

The lakes, which are covered by 10-15 ft. of ice, are located in the Antarctic "dry valleys," an area drier than the Gobi desert, receiving less than 10 cm. precipitation per year.

While temperatures outside the lakes average - 20 C, the lakes maintain stable year-round temperatures above freezing, McKay says. Lake Vanda, the warmest of the seven lakes studied, reaches temperatures of 25 C (77 F), according to McKay and Wharton.

A two-step ablation process effectively traps heat in the lakes. Heat is carried in by glacial meltstreams which feed the lakes in summer. Throughout the year, (at a rate of about three feet annually) ice is lost through ablatin from the top surface. As the top ice sublimates (goes directly from a solid to a gas), water beneath the ice layer freezes, releasing heat (the "latent heat of fusion") into the liquid water below, which thus stays relatively warm.

The ice cover also traps solar heat through insulation, an effect which provides about 50 % as much heat as the ablation mechanism.

By throttling gas exchange with the atmosphere, the thick ice cover also causes supersaturation of gases in the upper levels of the lake. As the water freezes beneath the ice layer, dissolved gases, carried in by the meltstreams, are forced back into the liquid water beneath. Oxygen levels three times normal, and nitrogen levels one and a half times normal, have been measured by McKay and Wharton.

Concentration of nitrogen would be particularly important for the possible generation of life on Mars, since the planet is now nitrogen-deficient and may have been in the past, according to McKay. Organisms use nitrogen for synthesizing proteins, which are necessary for most life processes.

Life in the Antarctic lakes consists primarily of single-celled plants and microorganisms, descendents of organisms which were deposited by winds when the lakes formed 100,000 to 200,000 years ago.

The organisms - algae, protozoa, bacteria and fungi - live in difficult conditions: the high-latitude lakes receive four months of continuous sunlight, four months of twilight and four months of darkness per year. Even during the brief Antarctic summer, less than 3 % of the sunlight available for photosynthesis penetrates the ice cover, the scientists say.

Stromatolites, layered fossils created by the accretion, over thousands of years, of algal remains and trapped sediments, are found on the lake bottoms. These stromatolites -- first discovered by Wharton and colleagues at Virginia Polytechnic Institute in 1979 -- are the only modern stromatolites found in a cold-water environment.

Stromatolites are among the oldest fossils known, with some dating back 3.8 billion years, to when life may first have originated on Earth. Today stromatolites are forming only in extreme environments such as salt flats and hot streams where metazoan predators are not found.

The Antarctic stromatolites suggest that some ancient stromatolites could have formed in colder waters than had been previously believed, Wharton says.

Studying the differences between modern warm-water and cold-water stromatolites, and comparing these to ancient stromatolites, may provide clues to the type of climate that prevailed in the distant past, Wharton says.

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Photographs of lakes, stromatolites, available, 415-694-5091.

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Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

C.J. Fenrick 415/694-5091

J. M. Tsoi

For Release:

Immediate

Release No. 86-31

NASA U-2 AIRCRAFT WILL STUDY CONTROLLED CALIFORNIA FOREST FIRE

Scientists at NASA's Ames Research Center, Mountain View, Calif., simultaneously will use remote sensing and ground survey to study a controlled forest fire in California's San Gabriel mountains.

The fire will be ignited by the U.S. Forest Service and Los Angeles County Fire Dept. in 1,000 acres adjacent to San Dimas, Calif. Two periods, Sept. 15 - Oct. 6 and Nov. 16 - Dec. 12, have been established for the burn.

The data will answer questions about the global effects of fire on atmospheric quality, air and water pollution, erosion, soil depletion and species extinction. Scientists will learn more about the effects of fire on different biogenic gases, such as nitrogen oxide and methane hydrocarbons, and how changes in these gases affect the atmosphere and, ultimately, the climate and biosphere.

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A controlled burn is an intentionally set fire that burns a prepared area of dead and live vegetation for the purposes of allowing researchers to study the nature of fire -- its movement, intensity, behavior and its effects on the land, water and the atmosphere.

Controlled burns are routinely planned by the Forest Service as a resource management mechanism for studying fire. For the first time, however, NASA will be involved in the simultaneous collection of data by remote sensing and ground survey.

NASA scientists Jim Brass and Vince Ambrosia, from the Ames Life Science Division, will monitor the downlink system which will receive black and white digital images from the U-2 aircraft flying overhead at 60,000 feet. The one-channel information can be relayed in real time onto a video display screen from the U-2 and be printed immediately into hard copy.

The simultaneous data transfer can help the Forest Service monitor and manage fires more effectively. Brass and Ambrosia primarily will concern themselves with collecting ground and aircraft data that will help researchers study the "biogeochemical" effects of fire. They will monitor pathways and changes in nutrient movement and examine the effects of airborne particulates in atmospheric chemistry as a result of fire.

Explaining NASA's involvement in the study, Ambrosia said, "NASA has participated previously in a controlled burn study in October, 1984, when the C-130 was used to 'fly' the burn and collect scanner imagery, but, to date, this is the first time scientists will be involved in an intensive ground collection of fire behavior data." Dr. Joel Levine, NASA's Langley Research Center, Hampton, Va., also will send researchers to the site to collect data concerning atmospheric changes and impacts due to fire.

Approximately 15 agencies will participate in the study including the U.S. Environmental Protection Agency, the California Air Resources Board, the Los Angeles County Fire Dept. and Dept. of Public Works. The U.S. Forest Service will provide most of the resources for the $750,000 study.

The fire will be started by a Los Angeles County Fire Dept. helicopter which will drop a "jelly-like" gasoline from a "heli-torch" and ignite the 1,000 acre area. The torch will be lit by an electronically triggered spark about 20 to 30 feet above the ground. The prescribed burn area will be ringed by a firelane ditch about the width of a 2-lane road.

The brush was cut in part of the area so that the effects of fuel from dead brush could be compared to fuel from live brush. About 300-400 firefighters located in the Los Angeles area will be on hand as extra precaution, although it is highly unlikely that the fire will break beyond the bulldozed area.

The combination of remote sensing and ground survey before, during and following the prescribed burn is expected to help scientists understand the nature of fire and its future impact on our environment.

September 18, 1986

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Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

C. J. Fenrick 415/694-5091

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Release No. 86-34

NASA SELECTS DIGITAL EQUIPMENT CORP. FOR CONTRACT NEGOTIATION

NASA's Ames Research Center, Mountain View, Calif., has selected Digital Equipment Corporation, Landover, Md., for negotiations leading to award of a contract to provide on-site preventive and remedial maintenance of government-owned computer systems and terminals at Ames.

The work will be performed under a firm, fixed-price contract with an estimated value of $6.5 million for a 5-year period. This contract is a consolidation of several purchase orders and contracts for automatic data processing maintenance services.

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October 2, 1986

NASA News

National Aeronautics and
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Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

For Release:

October 7, 1986

Debra J. Rahn
Headquarters, Washington, D.C.
(Phone: 202/453-2754)

Donald G. James
Ames Research Center, Mountain View, Calif.
(Phone: 415/694-5091)

Release No. 86-35

NASA AWARDS PRATT & WHITNEY CONTRACT FOR STOVL DESIGN WORK

NASA's Ames Research Center, Mountain View, Calif., has awarded a $9.4 million contract to Pratt & Whitney, West Palm Beach, Fla., for research, technology and developmental activities that could lead to a demonstrator supersonic research aircraft capable of short takeoff and vertical landing (STOVL) in the early 1990's.

A key factor in a STOVL aircraft program is development and integration of the propulsion system into the airframe. A propulsion system demonstration in the 1990's would use a derivative of an advanced technology engine, such as the PW5000 engine currently being developed by Pratt & Whitney for the U.S. Air Force.

The study will initially evaluate the integration of an advanced derivative PW5000 engine into four candidate propulsion system concepts. The four concepts under consideration are vectored thrust, ejector augmentor, remote augmented lift system and hybrid tandem fan.

This ground-based research program is a cooperative effort between NASA, the Defense Advanced Research Projects Agency and the U.S. Air Force.

The 3-year contract begins in October 1986.

- end -

NASA News

National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

Peter W. Waller 415/694-5091

For Release:
Immediate

Release No. 86-38

NOTE TO EDITORS

Andrew J. Stofan, Associate Administrator for Space Station at NASA Headquarters, Washington, D.C., will be in the Bay Area on Thursday, November 20. He will conduct a background briefing at 10:00 a.m. on that day at the Ames Research Center on progress of the first U.S. permanently manned space facility.

The Station, planned to be operational in 1994, will be assembled by astronauts in orbit, and will be the scene of dramatic space operations on a scale not so far seen.

Space Station has been designated as a national goal by President Reagan, and has received full funding of $410 million from Congress for fiscal 1987.

The Station will provide a laboratory and permanent astronomical observatories. It will be an assembly facility and staging base for manned and unmanned lunar and planetary missions, and a servicing facility for various missions.

Stofan will answer questions on the new Washington area-based management structure for Space Station, the selection process for the four major hardware development contracts, and the recent technical design review for the Station.

Fact sheets, brochures, and photographs will be provided on the Station, most of whose essential elements have been clearly identified. Videotape with on-orbit animation will be available for television.

News reporters planning to attend the briefing should come to the NASA gate of Moffett Field, where they will be directed to the briefing site, Building N-245.

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November 10, 1986

NASA News

National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

C.J. Fenrick 415/694-5091
Sophie Wilkinson

For Release:

Immediate

Release No. 86-40

NASA STUDY OF FOREST FIRE RESCHEDULED

Scientists at NASA's Ames Research Center, Mountain View, Calif., will get a second chance to study a controlled forest fire originally scheduled for mid-September.

The fire, planned to be set in California's San Gabriel mountains, September 15, was delayed because of bad weather. A storm front moved into the area, bringing wind and rain, and carrying clouds which would have obscured aerial photography of the fire.

The fire will be ignited by the U.S. Forest Service and Los Angeles County Fire Dept. in 1,000 acres adjacent to San Dimas, Calif. The fire will be studied during the period between November 18 and December 12. The exact day that the fire will be ignited is dependent upon weather conditions. At this time the weather is fairly stable except for some disturbance from Santa Ana winds.

Data from the fire will answer questions about the global effects of fire on atmospheric quality, air and water pollution, erosion, soil depletion and species extinction. Scientists will learn more about the effects of fire on different biogenic gases, such as nitrogen oxide and methane hydrocarbons, and how changes in these gases affect the atmosphere and, ultimately, the climate and biosphere.

-more-

A controlled burn is an intentionally set fire that burns a prepared area of dead and live vegetation for the purposes of allowing researchers to study the nature of fire -- its movement, intensity, behavior and its effects on the land, water and the atmosphere.

Controlled burns are routinely planned by the Forest Service as a resource management mechanism for studying fire. For the first time, however, NASA will be involved in the simultaneous collection of data by remote sensing and ground survey.

NASA scientists Jim Brass and Vince Ambrosia, from the Ames Life Science Division, will monitor the downlink system which will receive black and white digital images from the U-2 aircraft flying overhead at 60,000 feet. The one-channel information can be relayed in real time onto a video display screen from the U-2 and be printed immediately into hard copy.

The simultaneous data transfer can help the Forest Service monitor and manage fires more effectively. Brass and Ambrosia primarily will concern themselves with collecting ground and aircraft data that will help researchers study the "biogeochemical" effects of fire. They will monitor pathways and changes in nutrient movement and examine the effects of airborne particulates in atmospheric chemistry as a result of fire.

Explaining NASA's involvement in the study, Ambrosia said, "NASA has participated previously in a controlled burn study in October, 1984, when the C-130 was used to 'fly' the burn and collect scanner imagery, but, to date, this is the first time scientists will be involved in an intensive ground collection of fire behavior data." Dr. Joel Levine, NASA's Langley Research Center, Hampton, Va., also will send researchers to the site to collect data concerning atmospheric changes and impacts due to fire.

Approximately 15 agencies will participate in the study including the U.S. Environmental Protection Agency, the

California Air Resources Board, the Los Angeles County Fire Dept. and Dept. of Public Works. The U.S. Forest Service will provide most of the resources for the $750,000 study.

The fire will be started by a Los Angeles County Fire Dept. helicopter which will drop a "jelly-like" gasoline from a "heli-torch" and ignite the 1,000 acre area. The torch will be lit by an electronically triggered spark about 20 to 30 feet above the ground. The prescribed burn area will be ringed by a firelane ditch about the width of a 2-lane road.

The brush was cut in part of the area so that the effects of fuel from dead brush could be compared to fuel from live brush. About 300-400 firefighters located in the Los Angeles area will be on hand as extra precaution, although it is highly unlikely that the fire will break beyond the bulldozed area.

The combination of remote sensing and ground survey before, during and following the prescribed burn is expected to help scientists understand the nature of fire and its future impact on our environment.

November 18, 1986

NASA News

National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

Peter W. Waller 415/694-5091
Release No. 86-42

For Release:
Immediate

NOTE TO EDITORS: STOFAN SPACE STATION BRIEFING RESCHEDULED

Andrew J. Stofan, Associate Administrator for Space Station at NASA Headquarters, Washington, D.C., will be in the Bay Area on Wednesday, November 19, a day earlier than previously announced. He will conduct a background briefing at 10:00 a.m. on that day (November 19) at the Ames Research Center, on progress of the first U.S. permanently manned space facility. Stofan is the top NASA official for the Space Station project.

A previous Note to Editors had scheduled the visit and briefing for Thursday, November 20. The rescheduling reflects a change of travel plans.

The Station, planned to be operational in 1994, will be assembled by astronauts in orbit, and will be the scene of dramatic space operations on a scale not so far seen.

Space Station has been designated as a national goal by President Reagan, and has received full funding of $410 million from Congress for fiscal 1987.

The Station will provide a laboratory and permanent astronomical observatories. It will be an assembly facility and staging base for manned and unmanned lunar and planetary missions, and a servicing facility for various missions.

Stofan will answer questions on the new Washington area-based management structure for Space Station, the selection process for the four major hardware development contracts, and the recent technical design review for the Station.

Fact sheets, brochures, and photographs will be provided on the Station, most of whose essential elements have been clearly identified. Videotape with on-orbit animation will be available for television.

News reporters planning to attend the briefing should come to the NASA gate of Moffett Field, where they will be directed to the briefing site, Building N-245.

November 14, 1986

NASA News

National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

Debra J. Rahn
Headquarters, Washington, D.C.
(Phone: 202/453-2754)

For Release:
December 16, 1986

C. J. Fenrick
Ames Research Center, Mountain View, Calif.
(Phone: 415/694-5091)

Release No. 86-48

HIGH ALTITUDE EARTH RESOURCES AIRCRAFT SUPPORT SERVICES CONTRACT AWARDED

NASA Ames Research Center, Mountain View, Calif., has awarded the Lockheed Corp., Lockheed Calif. Co., Advanced Development Projects, Burbank, Calif., a support services contract for the High Altitude Earth Resources Aircraft Program.

The estimated value of this 5-year cost-plus fixed-fee contract is approximately $22 million.

The work, now being performed at Ames, includes maintenance, engineering and piloting services for NASA's u-2 and ER-2 aircraft.

-end-

NASA News

National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

Peter Waller, Linda Blum

December 23, 1986
Release No. 86-50

To editors:

NASA and NOAA scientists will begin a major airborne science project to study global ozone depletion on January 15, 1987. They will use a high-altitude NASA Ames Research Center ER-2 aircraft equipped with 16 scientific instruments to probe the atmosphere at 65,000 feet above Darwin Australia.

The month-long experiment in Autralia will be one of the largest airborne atmospheric science experiments ever conducted, with more than 50 researchers participating.

A briefing on the mission, and a chance to view and photograph the ER-2 and its experiments before departure for Australia will take place on Friday, January 2 at 10 a.m. at NASA-Ames.

Damage to the ozone layer would have major consequences for human beings and the ecosystem. Substantial ozone loss would lead to millions of cases of human skin cancer. It would harm aquatic plants and animals, including the single-celled organisms which form the crucial base of the food chain. "Maintenance of the ozone layer is essential to life on Earth," said project manager Philip Russell, of NASA-Ames.

The ER-2 (Earth Resources-2) aircraft is a larger, advanced, civilian version of the U-2 surveillance aircraft. It is the only subsonic aircraft that can fly above 60,000 feet, and thus the only aircraft that can carry out air-sampling experiments in the stratosphere above the tropics.

News reporters coming to the briefing should come to the NASA gate of Moffett Field, and will be directed to the ER-2. Printed materials and a television clip of the ER-2 in flight and other operations will also be available.

NASA News

National Aeronautics and
Space Administration

Washington, D.C. 20546
AC 202-453-8400

Debra Rahn
Headquarters, Washington, D.C.
(Phone: 202/453-2754)

Donald G. James
Ames Research Center, Mountain View, Calif.
(Phone: 415/694-5091)

For Release:
Embargoed Until
November 7, 1986

RELEASE: 86-158

NASA DEDICATES NEW RESEARCH LABORATORY

NASA's Ames Research Center, Mountain View, Calif., officially dedicated its newest research facility today, the Fluid Mechanics Laboratory.

Ames scientists and engineers anticipate that this facility will stimulate breakthroughs in basic knowledge of aerodynamic flows. Important technological applications, ranging from developing fuel-efficient aircraft to low-speed research on the National Aero-Space Plane, will be addressed in the new lab.

"The unique feature is that this new laboratory can support multiple, simultaneous small-scale wind tunnel research with full access to supercomputer resources for thorough analyses of theory and experiment", says Dr. Sanford Davis, chief, fluid dynamics branch.

A significant portion of the lab will be devoted to vortex flows. A major factor in the development of enhanced vehicle maneuverability and reduced drag by aerodynamic means is the use of effective vortex control devices. The key to control is the use of emerging computational tools for predicting viscous fluid flow in close coordination with fundamental experiments. In fact, these extremely complex flow fields require an intimate relationship between computation and experiment. Examples of current research in this area will be shown in the lab.

Researchers will be able to conduct experiments, get nearly real-time theoretical feedback and be able to alter the experiment to test a variety of configurations or test environments.

- more -

The $2.35 million, 21,336 sq. ft. facility houses small-scale wind tunnels for advanced experimental and computational research in fluid mechanics and will serve as a national focal point for government/industry/university cooperation. The wind tunnels will be supported with the most advanced optical and electronic instrumentation. The FML also will serve as a center for advanced computer/experiment integration by taking advantage of Ames' extensive computational resources.

- end -

This release and other NASA information is available electronically through ITT Dialcom. For access to NASA News through this system, contact Jim Hawley, ITT Dialcom, Inc. at 202/488-0550.

NASA News

National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, California 94035
AC 415 965-5091

Debra J. Rahn 202/453-2754

C.J. Fenrick 415/694-5091

For Release

Immediate

Release No. 87-01

NORTHERN TELECOM, INC. SELECTED FOR CONTRACT NEGOTIATION

NASA's Ames Research Center, Mountain View, Calif., has selected Federal Systems Division, Northern Telecom, Inc., Vienna, Va., for final negotiations leading to the award of a firm-fixed-price contract. The contract has a proposed value of approximately $20 million for the first 5 years.

Northern Telecom, Inc. will provide for the acquisition, on-site installation, maintenance, operation and expansion of a voice and data digital telecommunications system.

The contract will provide options to extend the contract, in 1-year periods, for maintenance, operations and system expansion for a total performance period of up to 10 years.

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February 2, 1987

NASA News

National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, California 94035
AC 415 965-5091

Peter W. Waller 415/694-5091

Linda Blum

Patricia Long

For Release

Immediate

Release No. 87-02

NASA'S POWERFUL SUPER-COMPUTER SYSTEM TO GO OPERATIONAL

NASA's numerical aerodynamic simulation (NAS) computer system, considered the world's most powerful computing system, will be operational in early March.

To mark this event, dedication ceremonies will take place on March 9 at the NAS site, NASA's Ames Research Center, Mountain View, Calif. Other events include a symposium on the future implications of super-computer systems for society, tours and illustrations of system capabilities. An air show also will take place.

NAS will be used for pioneering research in aeronautics. This includes work on the National Aero-Space Plane Program, a joint DOD/NASA program to validate a wide range of aerospace vehicle technologies and capabilities including horizontal

-more-

takeoff and landing, single-stage operation to orbital speeds and sustained hypersonic cruise within the atmosphere using airbreathing propulsion. A wide variety of future operational aerospace vehicles may be possible as a result of this technology development and validation program, ranging from space launch vehicles to long-range air defense interceptors and hypersonic transports.

The NAS system will help ensure continued national preeminence in aeronautical research. It will allow major steps toward simulating actual aircraft flight in a computer, making possible important advances in aircraft design -- reducing cost and increasing performance. NAS will serve as a pathfinder capability in supercomputing for government, universities and industry and will encourage development of improved supercomputers.

NAS also will be used for computational chemistry, weather modeling, astrophysics applications and genetics research.

Project officials emphasize that NAS is not a set of computer hardware, but an evolving capability. NAS is an array of people, skills, powerful central processors, a nation-wide communications network and a range of computation, scheduling, and output devices.

The operational system will be capable of a quarter of a billion computations per second. This speed will be increased to a billion calculations per second with acquisition of a second high-speed processor this year and to 10 billion calculations per second within a decade.

The NAS system is presently driven by the Cray 2 supercomputer, which has an enormous 256 million word internal memory, 16 times larger than those of previous supercomputers. Planners for NAS expect to have the two fastest supercomputers available as central computing engines for the system. As a faster processor is developed by industry and becomes available, it will be acquired and the slower of the two current central supercomputers will be retired.

A national network will allow off-site scientists, at 27 locations, access to the system via satellite or high-speed terrestrial lines. More than 250 scientists and engineers will be using the system.

The NAS building is equipped with an array of systems for the optimal functioning of the computers. The 90,000-square-foot structure has a 14,000-square-foot central computer room, bronzed windows which dim entering sunlight and a climate cooling system 28 times more powerful than in a normal office building of the same size.

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February 2, 1987

LBH

NASA News

National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, California 94035
AC 415 965-5091

Peter W. Waller 415/694-5091
Linda Blum
Patricia Long

For Release

Immediate

Release No. 87-03

Note to Editors:

NASA's Ames Research Center will have facilities and make arrangements for news media on the occasion of the Numerical Aerodynamic Simulator (NAS) supercomputer system becoming operational on March 9.

The NAS system, which is the world's most advanced supercomputer system, is a major national facility, devoted primarily to pioneering research in aeronautics. It will help ensure continued national preeminence in aircraft design, in a period when aeronautics products (our largest export after agriculture) are important to solving the major problem of U.S. trade deficits.

NAS will also be used for a wide range of advanced research requiring radical increases in computer power. This includes modeling the Earth's weather, studying galactic formation, simulating complex chemical reactions, as well as materials and genetics research.

NAS is an evolving system which will always incorporate the most advanced supercomputer technology as it becomes available. At any given time, the system will employ the two fastest supercomputers in existence. The system is currently driven by the most powerful version of Cray Research's Cray-2 supercomputer, which is capable of 250 million computations per second and has an enormous 256-million-word internal memory. Later this year, NAS will purchase a second, four-times-faster central processor, which will be capable of one billion computations per second.

NAS will be used to develop technology for the planned hypersonic aerospace plane, the "Orient Express," which could take off from a runway and accelerate directly into orbit. The

-more-

NAS system will serve as a pathfinder to stimulate development of supercomputing by industry, universities and government.

A variety of events have been planned to mark the system's operational status. The NAS system will be dedicated by NASA Administrator James C. Fletcher. A symposium on the impact of supercomputing on society will be held, featuring Thomas Paine, Chairman of the National Commission on Space; Dean Thornton, President of Boeing Commercial Airplane Company; Bernard Oliver, computer research pioneer and chief of NASA's Search for Extraterrestrial Intelligence (SETI) program (which scans by supercomputer); Gary Demos of Whitney/Demos Productions, leader in developing computer graphics for motion pictures; and David Perlman, Associate Editor and Science Editor, San Francisco Chronicle. Other aspects of the program include dramatic super-screen computer graphics, speeches, and flight demonstrations of experimental aircraft.

News center for the event will open Thursday, March 5, and various coverage opportunities will be available from then on. An advance background briefing will take place on Friday, March 6, and a round up press conference will be held at 9:30 a.m., March 9. This will be followed by a tour of the NAS facility and by the dedication event. Tours of Ames Research Center, including wind tunnels, hangars, flight simulators, and planetary mission facilities, will also take place. For media interested in Ames stories in such areas as planetary science, life sciences and aeronautics, appointments with scientists can be arranged through the Ames Public Information Office (415/694-5091).

Facilities for the press will include a press room and television support. (Information on hotels and transportation to Ames Research Center is attached.)

It is not necessary to make application for accreditation, but it would be helpful if you notify us by letter or telephone (415/694-5091) by March 2, if you plan to attend.

On the day of the event, March 9, news media should arrive at Ames Research Center from 8:45 - 9:00 a.m. Entry to Ames should be by the NASA Gate (Gate 18) of Moffett Field. NASA access badges and parking permits will be issued at the Security Station near the NASA gate, upon presentation of credentials. Lunch will be available for purchase on-site or at restaurants in nearby commercial districts.

Press arriving March 5-6 should come to the NASA-Ames Visitor Reception Building. Weekend arrivals (March 7-8) should come to the Main Gate of Moffett Field.

February 11, 1987

SCHEDULE FOR PRESS

Time	Event	Location (Building)
Thursday, March 5, 1987		
1:00 p.m. -- 4:30 p.m.	Press room opens	N-258, Room 125
Friday, March 6, 1987		
8:00 a.m. -- 4:30 p.m.	Press room open	N-258, Room 125
2:00 p.m.	Advance background briefing	N-245 Auditorium
1:00 p.m. -- 4:00 p.m.	Photo opportunity, workstations and Cray-2 (Project officials available)	N-258
Saturday, March 7, 1987		
8:00 a.m. -- 4:30 p.m.	Press room open	N-258, Room 125
Sunday, March 8, 1987		
8:00 a.m. -- 4:30 p.m.	Press room open	N-258, Room 125
1:00 p.m. -- 4:00 p.m.	Photo opportunity, workstations and Cray-2 (Project officials available)	N-258
4:30 p.m.	Hospitality Suites for early arrivals (social only) Hotels: Sunnyvale Hilton, Hyatt Palo Alto, The Woodmark	

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Monday,
March 9, 1987

7:00 a.m. -- 7:00 p.m.	Press room open	N-258, Room 125
8:30 a.m. -- 9:15 a.m.	Photo opportunity, workstations and Cray-2 (Project officials available)	N-258, Room 125
9:30 a.m. -- 10:30 a.m.	Press briefing	N-245 Auditorium
10:40 a.m. -- 11:20 a.m.	Press tour and photo session of Cray-2 computer and NAS workstations	N-258, Room 125
11:30 a.m. -- 12:30 p.m.	Dedication event	N-258
1:15 p.m. -- 2:15 p.m.	Optional photo opportunity (by appointment)	N-258 Auditorium
2:30 p.m. -- 5:00 p.m.	NAS Symposium (Press/TV area available)	N-201
5:00 p.m. -- 5:30 p.m.	Press interviews of speakers	N-201

Tuesday,
March 10, 1987

8:00 a.m. -- 4:30 p.m.	Press room open	N-258, Room 125

February 12, 1987

PROGRAM

Dedication of the Numerical Aerodynamic Simulation Capability

Sunday,
March 8, 1987

4:30 p.m.	Hospitality Suites -- Hyatt Palo Alto, Sunnyvale Hilton, The Woodmark

Monday,
March 9, 1987

9:00 a.m. -- 11:15 a.m.	VIP welcome tours (NASF, NFAC, Flight Line)
9:30 a.m. -- 10:30 a.m.	Press Briefing (Dr. Raymond S. Colladay, Dr. William F. Ballhaus, Jr., Mr. Victor Peterson and Dr. F. Ronald Bailey)
10:40 a.m. -- 11:20 a.m.	Press tour of NAS Facility
10:50 a.m.	Director's Reception for invited guests
11:30 a.m. -- 12:30 p.m.	NAS Dedication event
1:00 p.m. -- 2:15 p.m.	Luncheon reception for guests
1:00 p.m. -- 4:00 p.m.	Dedication guests self-guided tour of NASF, NFAC, Flight Line displays
2:30 p.m. -- 3:00 p.m.	Flight demonstrations -- Tilt Rotor (XV-15), QSRA (STOL), Harrier (VTOL)
2:30 p.m. -- 5:00 p.m.	Press/Public Symposium "Shaping the Future: The New Era in Scientific Computing" Dean Thornton Thomas Paine Bernard Oliver Gary Demos David Perlman
5:00 p.m. -- 5:30 p.m.	Press interviews of Symposium speakers

February 12, 1987

DEDICATION
OF THE
NUMERICAL AERODYNAMIC SIMULATION CAPABILITY
MARCH 9, 1987

PROGRAM

Prelude........................	The U.S. Navy Band Treasure Island Naval Air Station
Welcoming Remarks..............	Dr. William F. Ballhaus, Jr. Director, Ames Research Center
Presentation of Colors.........	The U.S. Air Force Color Guard Onizuka Air Force Station
The National Anthem............	The U.S. Navy Band
Introduction of Guests.........	Dr. William F. Ballhaus, Jr.
Remarks........................	Dr. Raymond S. Colladay Associate Administrator, Office of Aeronautics and Space Technology
Keynote Address................	Dr. James C. Fletcher Administrator, NASA
Act of Dedication..............	Dr. James C. Fletcher
Closing Remarks................	Dr. William F. Ballhaus, Jr.
Postlude.......................	The U.S. Navy Band

SYMPOSIUM

Shaping the Future

A new era in scientific computing

March 9, 1987 2:30-5 PM

Welcoming Address

William F. Ballhaus, Jr., Director, NASA's Ames Research Center

Introduction

Raymond S. Colladay, Associate Administrator for Aeronautics and Space Technology, NASA Headquarters

Speakers

Designing the Future in Aeronautics and Aerospace Transportation

Dean Thornton, President, Boeing Commercial Airplane Company

Supercomputing and the Blueprint for the Space Frontier

Thomas Paine, Thomas Paine Associates, Chairman, National Commission on Space

Technology and the Search for Extraterrestrial Intelligence

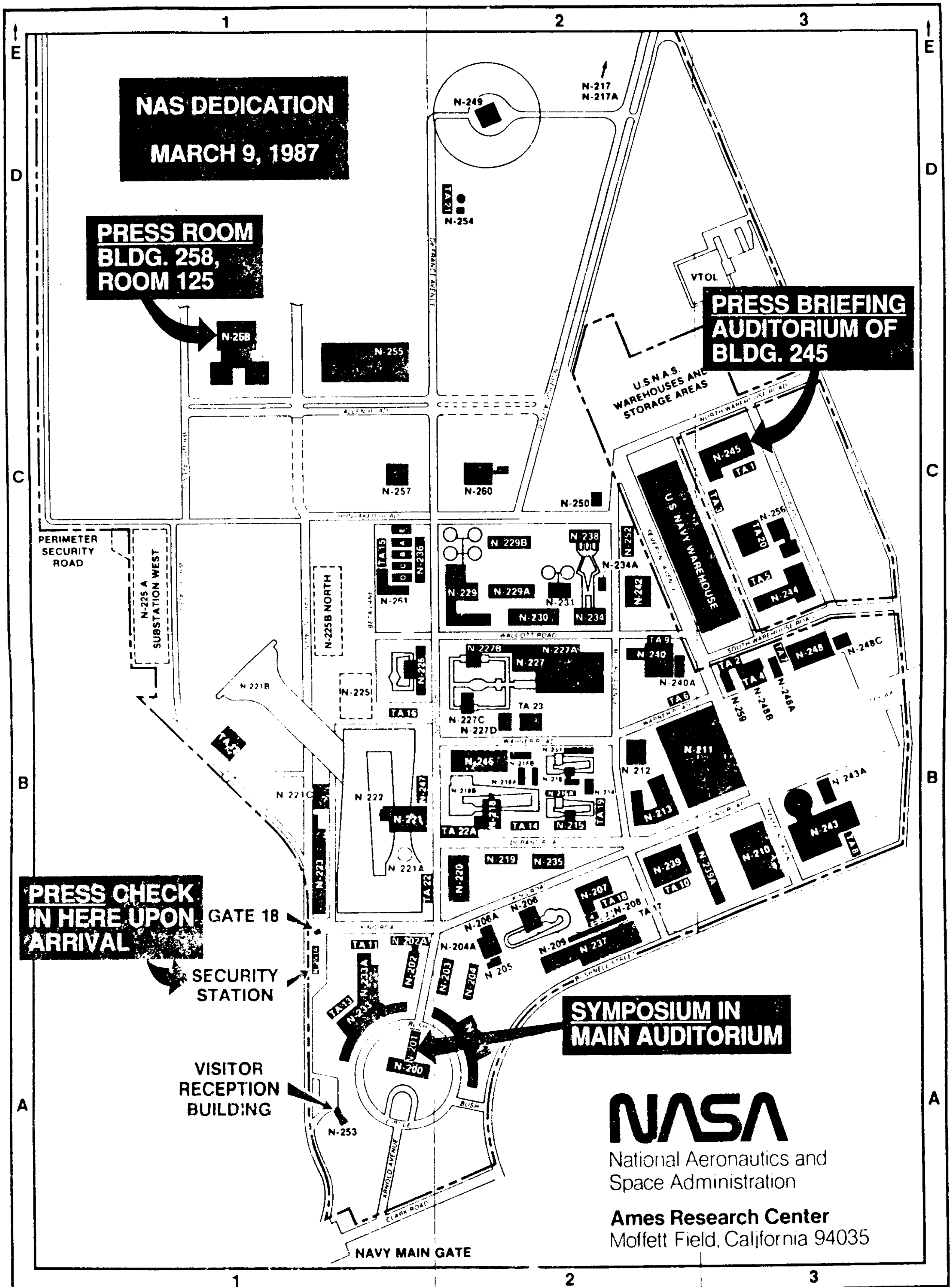
Bernard M. Oliver, Chief, Search for Extraterrestrial Intelligence (SETI) Office

New Tools for Visualizing the Future

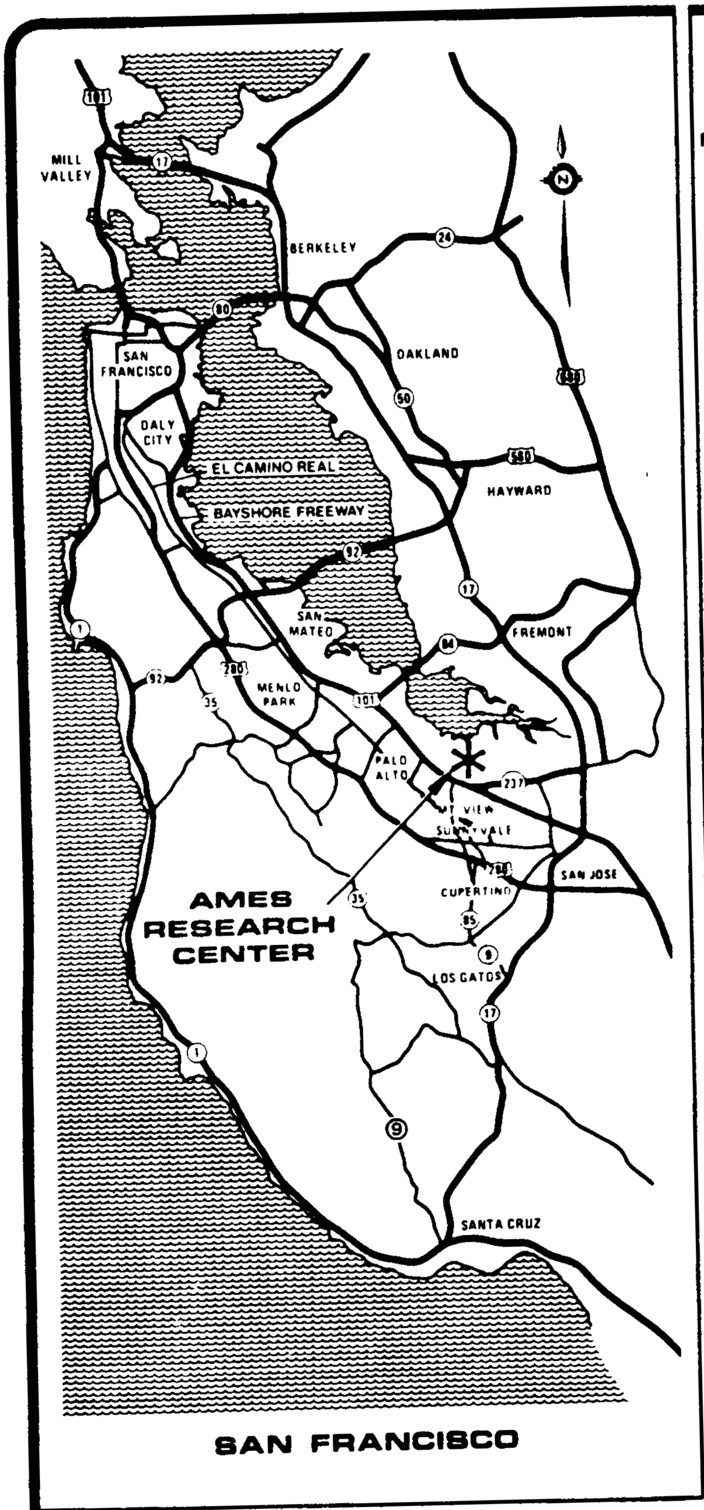
Gary Demos, Whitney/Demos Productions
(Mr. Demos will show animated footage from major motion pictures generated by supercomputers.)

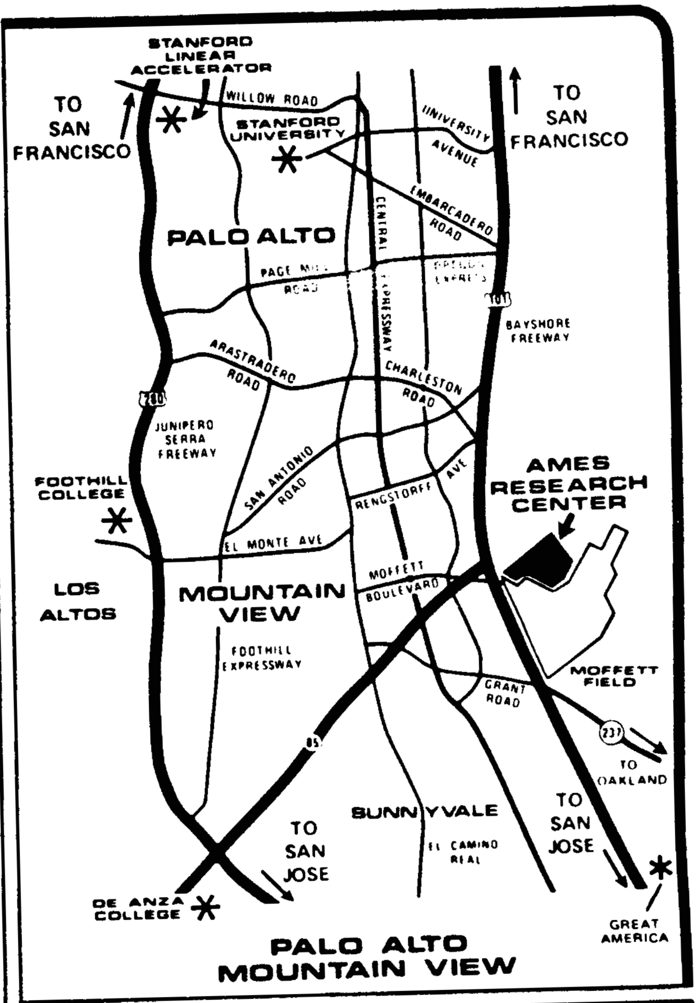
Human Aspects of the Revolution in Supercomputing

David Perlman, Associate Editor and Science Editor, San Francisco Chronicle

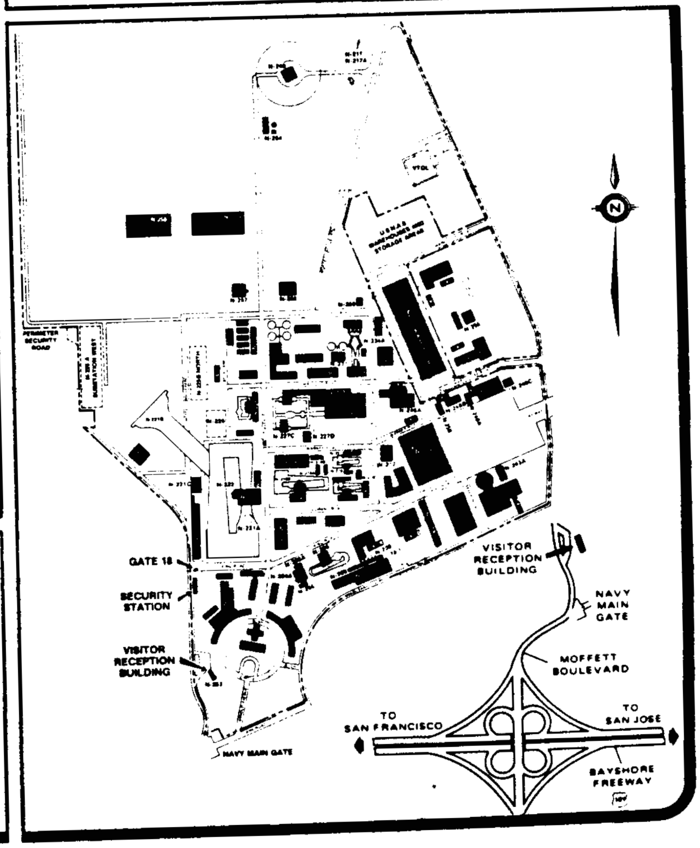


OCTOBER 1986





VISITOR INFORMATION MAP



TYPICAL RESTAURANTS*

Fast Food	Arby's	601 S. Bernardo Ave. (at El Camino), Sunnyvale 225 S. San Antonio Road, Mountain View
	Jack-In-The-Box	200 El Camino Real W., Mountain View 580 N. Rengstorff Ave., Mountain View
	McDonald's	952 El Monte Ave., Mountain View 556 E. El Camino Real, Sunnyvale

Coffee Shops Denny's, 870 Leong Drive, Mountain View,
Marie Callender Pie Shops
751 E. El Camino Real, Sunnyvale
4710 El Camino Real, Los Altos

Restaurants
Andy's Chinese Restaurant, 174 Castro St., Mountain View, (415) 968-9494
Charley Brown's, 1116 N. Mathilda Ave., Sunnyvale, (408) 734-3460
Chez Yvonne, 1854 El Camino Real W., Mountain View, (415) 967-6742
Florentine Restaurant & Pizza, 118 Castro St., Mountain View, (415) 961-6543
Frankie, Johnnie & Luigi Too, 939 El Camino Real W., Mountain View, (415) 967-5384
Iron Works, 3877 El Camino Real, Palo Alto, (415) 493-3433
Michael's Restaurant, 830 E. El Camino Real, Sunnyvale, (408) 245-2925
Ming's, 1700 Embarcadero Road, Palo Alto, (415) 856-7700
The Fish Market, 3150 El Camino Real, Palo Alto, (415) 493-9188
Tia Maria, 4470 El Camino Real, Los Altos, (415) 941-6290

HOTELS AND MOTELS*

Cabana Hyatt House Hotel, 4290 El Camino Real, Palo Alto, (415) 493-0800
Currier Motel, 3200 El Camino Real, Palo Alto, (415) 493-9085
Holiday Inn, 625 El Camino Real, Palo Alto, (415) 328-2800
Marriott Hotel, Great America Pkwy. and Mission Blvd., Santa Clara, (408) 988-1500
Motel 6, 806 Ahwanee Ave., Sunnyvale, (408) 739-4450
4301 El Camino Real, Palo Alto, (415) 941-0220
Rickey's Hyatt House Hotel, 4219 El Camino Real, Palo Alto, (415) 493-8000
The County Inn, 850 Leong Drive, Mountain View, (closest to Ames), (415) 961-1131
Travelodge, 3255 El Camino Real, Palo Alto, (415) 493-6340

PARKS AND RECREATION AREAS

Cuesta Park, 685 Cuesta St., Mountain View (corner of Cuesta and Grant Road)
Mitchell Park, Charleston & Middlefield Roads, Palo Alto
Mountain View Recreation and Parks Area (closest park to Ames), 200 S. Rengstorff Ave., & Alma St., Mountain View

OTHER SIGHTS

DeAnza-Minolta Planetarium, Cupertino, (408) 996-4814
Egyptian Museum, San Jose, (408) 287-9171
Foothill Electronics Museum, Los Altos Hills, (415) 948-8590
Marriott's Great America, Santa Clara, (408) 988-1500
Stanford Linear Accelerator, Palo Alto, (415) 854-3300

APPROXIMATE MILES AND DRIVING TIMES TO AMES RESEARCH CENTER

City	Miles	Driving Time	City	Miles	Driving Time
Fresno	158	3-1/4 hours	Sacramento	119	2-1/3 hours
Los Angeles (101)	389	7-1/2 hours	San Francisco	34	1 hour
Modesto	100	2-1/4 hours	San Jose	15	3/4 hours
Monterey	85	1-3/4 hours	Santa Rosa	94	2 hours
Oakland	46	1 hour	Walnut Creek	50	1 hour
Redding	270	5-1/2 hours			

*THIS LISTING IS OF TYPICAL ESTABLISHMENTS AND DOES NOT IMPLY ENDORSEMENT.

NASA News

National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, California 94035
AC 415 965-5091

For Release

Peter W. Waller 415/694-5091
Patricia Long
Linda Blum

Immediate

Release No. 87-4

ELEMENTS OF THE NAS SYSTEM

The major computers and peripherals are:

1	Cray-2 supercomputer (Cray Research, Inc.)
2	Amdahl 5840 computers (Amdahl Corporation)
5	VAX 11/780 computers (Digital Equipment Corporation)
25	IRIS 2500 graphics workstations (Silicon Graphics, Inc.)
22	DD49 disc drives (Control Data Corporation)
56	Amdahl 6380 disk drives (Amdahl Corporation)
6	Memorex 3228 tape drives (Memorex Corporation)
2	IBM 3480 cartridge tape drives (International Business Machines Corporation)

(1 HSP-2 (High Speed Processor-2), vendor not yet selected, to be acquired in 1987.)

The communications network consists of the following hardware:

HYPERchannel (Network Systems Corporation)

-more-

Ethernet (Digital Equipment Corporation, Intel Corporation, and Xerox Corporation)

Micom Switches (Micom Systems, Inc.)

Vitalink Communicaiton Servers (Vitalink Corporation)

The major software components of the NAS operating system, VINOS (Vendor Independent Network Operating System), are:

UNIX (Cray's UNICOS, Amdahl's UTS, and IRIS GL2-W2.3 based on AT&T's System V UNIX)

UNIX 4.2 BSD (University of California at Berkeley)

DI-3000 Graphics Package (Precision Visuals Corporation)

TCP/IP Network Communications (DoD Internet Protocol Standard)

Network Queueing System (NAS Batch Job Controller)

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Peter Waller 415/694-5091
Roberta Friedman

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Fact Sheet

NASA Numerical Aerodynamic Simulation Facility

NASA's Numerical Aerodynamic Simulation (NAS) Facility houses the world's most powerful supercomputer system.

The NAS computer network is located at NASA's Ames Research Center in Mountain View, California. The system is devoted to pioneering research and development in aerodynamics -- the study of airflow around and forces generated by aircraft in Earth's atmosphere. In a sense it will be possible to "fly" proposed designs of new aircraft in the simulation facility.

A series of steps during the next decade will greatly increase the power of the NAS network.

*1987--
The Cray 2, the initial high-speed processor, operates at a rate of 250 Mflops (million floating point operations per second) on aerodynamic applications; capacity of the central memory is 256 million words (each word being 64 bits). Remote users at 27 locations throughout the country will be able to access NAS.

*late 1987--

(more)

Scale-up of speed to a billion computations per second; addition of advanced graphics displays and processing; additional remote users will be able to access NAS.

*1990's--
Increases in memory to a billion words and speed to 4 billion computations per second.

Funding for NAS was approved in fiscal year 1984. Total funding for the development phase of the project is estimated at just under $100 million.

Originally, NASA thought it would have to develop its own supercomputers to meet its needs. But advances in supercomputer development by industry will allow NASA to put together a system that incorporates commercially available supercomputers. In effect, NASA will serve as the pathfinder for new advances in supercomputers.

A Complement to Wind Tunnels

Computer simulations will provide a needed supplement to aircraft wind tunnel testing, allowing study of many more aircraft configurations and reducing the cost involved in developing new aircraft.

The cost of developing prototype aircraft and testing them in wind tunnels has increased substantially in recent years, while the cost of computing time has dropped almost two orders of magnitude over the past decade.

The efficiency of the calculation routines that generate computer solutions--algorithms--has dramatically increased. The exceptional speed and memory of the NAS system will allow scientists to simulate more complex configurations of aircraft. Numbers generated by the supercomputers can be converted into computer-generated pictures or movies that show flow phenomena.

(more)

NAS will allow researchers to test preliminary aircraft designs by computer. The best of the proposed designs can then be converted into models and "flown" in wind tunnels. This strategy will help scientists to pinpoint potential problems in a prototype aircraft design, and thus avoid costly alterations at later stages in the design process.

Features of the NAS Network

Whereas most computer centers are built around one manufacturer's machine, NAS is being set up to accept the newest and fastest computers from any company as they become available. The software and operating system for the network will be able to accommodate any manufacturer's product with minimal disruption.

This section details the basic features of the NAS network, a supercomputer system designed to incorporate the evolutionary advances necessary to maintain a state-of-the-art computational capability.

* High-speed processing is at the heart of the system. When the extended operational configuration is fully operational in 1988, two high-speed computers will reside in the system at all times. To update the system with the latest supercomputer technology, the older of the two computers will be replaced by a new, faster computer as soon as it becomes available.

The first high-speed processor in the NAS system is the Cray Research's Cray 2 supercomputer. It represents the latest in computer miniaturizations: it is only four feet high and four feet in diameter. (Its walls are curved into a "C" shape.)

The Cray 2 achieves its super speed from closely packed chips. But crowding and high power build up heat in a small space, so the densely packed chips could damage each other. To solve this problem, the Cray 2 is the first computer to have its chips totally immersed in an inert fluid that draws away excess heat. The fluid, which is the same kind used as an artificial plasma to replace human blood, is non-conductive and will not damage the chips. Earlier computers used forced air cooling and piped coolant to control excess heat buildup.

* Microprocessor-based workstations are used at Ames primarily to display graphics, but also to manipulate text and data. Small scale-computations also can be performed at these workstations.

The IRIS (Integrated Roster Imaging System) 2500 Turbo and IRIS 3030 by Silicon Graphics, Inc. have been selected as the workstation models. For general computing power, these have a Motorola 68020 microprocessor and a Weitec floating point chip set. Realtime graphics capability is provided through Silcion Graphics, Inc., proprietary VOSI chips, known as the Geometry Engine. The multicolor display has a resolution of 1024 x 1024 pixels (television sets have about a 250 x 250 pixel resolution). The IRIS can transform images from flow calculations at a rate of more than 80,000 points per second.

* A subsystem for graphics displays of aeronautic simulations will have improved performance and additional storage capabilities as compared to the individual workstations. NASA expects it to have a 4000 x 4000 pixel resolution and the capability to generate real time graphic displays.

* Two Amdahl 5840 "mainframe" computers handle interactions between the supercomputers and Ames users who have terminals (users with workstations will directly access the supercomputers). Users who are not at NASA-Ames can also "talk" to the supercomputers through the Amdahl mainframes and long haul communications systems.

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The Amdahl 5840's also store and distribute data files to a "mass storage" subsystem and maintain a directory of all files stored in the NAS system. The mass storage subsystem provides 120 billion bytes (characters) of disk memory storage. This capacity will be doubled later this year.

The mainframes also support data communications with the supercomputers at speeds ranging from 1200 bits per second to 1.5 million bits per second. Communication hook-ups are by high speed telephone lines or by satellite.

NASA provides access to its supercomputer network to off-site researchers in private industry, universities and other government agencies. The NAS User-Interface Group, representing thirty organizations from airspace industry, unversitities, NASA, the U.S. Department of Defense, and other government research centers, has participated in the NAS project throughout the program's development.

* All the computers are operated with AT&T'S Unix System V operating system.

Special Features of the NAS Facility

March 14, 1985 was the groundbreaking for the building that houses the supercomputers which are the heart of the NAS network. The concrete building has a total of 90,500 square feet, with 14,000 square feet devoted to the high speed processing computer room. The floors of this room are built to handle twice the load of a standard computer floor.

The big computers will also place special cooling demands on the NAS building. The NAS Facility has 2,800 tons of air conditioning equipment, whereas a normal office building of comparable size requires only one hundred tons. The term "tons" refers not to the weight of the equipment, but to its cooling

(more)

capacity -- the cooling power of one hundred tons of melting ice per day.

Excess heat generated by the complex multicomponent network processing system is removed by seventeen 40-ton "air handler" units that line the walls of the central computer room. These units contain coils of pipes similar to the coils in a household refrigerator. Warm room air is drawn in and cooled by passage over the coils, with the heat being transferred to the water within the coils. In turn, the water in the coils is cooled by four 700-ton "chillers" located on the ground floor below the central computer room. These chillers keep the water in the coils at a temperature of 45 to 55 degrees, and the central computer room temperature between 68 and 70 degrees.

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Ames Research Center
Moffett Field, California 94035
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For Release:

Peter Waller 415/694-5091

Linda Blum

IMMEDIATE

Release No. 87-06

SPACE TECHNOLOGY BRINGS NEW FINDINGS ON ANCIENT MAYA

Satellite images of Mexico's Yucatan Peninsula, central Guatemala and Belize have led to new discoveries about ancient Maya settlement patterns, environmental setting, and natural resource use. NASA scientists have found evidence of an ancient river plain, sea level changes, and tectonic fault lines, which may have been important geographic elements in shaping the ancient Maya civilization.

Investigators at NASA's Ames Research Center in Mountain View, Calif., are also using the satellite imagery to detect Mayan water sources, such as natural wells and ponds, and compare their location to those of ancient Maya ruins. The investigators believe the remote sensing project will help resolve a central question in Maya studies: how the Maya built a sophisticated civilization in a relatively resource-poor environment. They

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also hope to gain understanding of the mysterious cycles of expansion and decline that characterize Maya civilization. Many scholars believe that environmental problems, including misuse of resources, may have led to the periods of decline. The Maya civilization, noted for elaborate temples, advanced mathematics and astronomy, and large-scale agriculture, spread across Central America from 2000 BC until the Spanish conquest in the 16th Century.

While remote sensing has been widely used to search for archaeological sites, the Ames project is among the first to use space technology to attempt to understand an ancient civilization by studying its environment. "In combining remote sensing, environmental studies and archaeology, this is a pioneering effort," said project chief Charles Duller, of NASA-Ames.

Using EOSAT and EROS imagery from the Landsat 5 satellite, which has an advanced multi-spectral sensor called Thematic Mapper, the NASA-Ames researchers have imaged more than 24,000 sq. miles of the northern Yucatan Peninsula. A total of 50,000 sq. miles will be imaged by 1987. Researchers are also studying the Mayan environment in central Guatemala, Belize and Quintana Roo, Mexico, with SEASAT, a radar-equipped satellite which operated in 1978. (SEASAT data was supplied by the National Oceanic and Atmospheric Administration and NASA's Jet Propulsion Laboratory.)

Analysis of the Landsat images has shown that ancient Maya settlements in the northern Yucatan were closely concentrated along faults and fracture zones in the Earth. The fracture zones, shallow depressions created by tectonic fault lines in the bedrock, provide close access to subsurface water and have the best soil in the region. Previously, scientists had believed that topographical features in the flat, densely-forested region were too small and scattered to affect Maya settlement patterns.

"We've found a very dramatic difference in resource distribution in what was thought to be a relatively undifferentiated region," said noted Mayan archaeologist Edward Kurjack of Western Illinois University in Macomb, the principal archaeological collaborator in the project.

In another research area, using SEASAT data, Duller has discovered what appears to be an ancient river plain extending 300 miles across lowland Guatemala. If confirmed by ground-based studies, the finding could explain the location of Tikal, a major Mayan trade and ceremonial center from 200 BC - 900 AD. Tikal appears remote and landlocked today.

The dry river plain would also provide evidence of a changing climate, which could explain why the Maya abandoned major centers in this region in the tenth century, as archaeological findings suggest.

A third major focus of investigation is the Yucatan's Peninsula's Northern coastline. Scholars have long known that

-more-

the sea level along the Yucatan rose during Maya times, inundating the coast and increasing the salinity of the subsurface water table. The rise in sea level curtailed the important Maya salt trade as salt flats became submerged, shut down coastal settlements, and may have affected agriculture far inland. The Ames researchers have found the satellite images show natural linear features marking former coastlines beneath the water, enabling mapping and dating of various changes in the sea level. Duller and Kevin Pope, a paleoecologist now at NASA-Ames, have begun analysis of the coastline changes.

The research is also focused on studying the availability and use of surface water by the Maya. "Water is the key to understanding the Maya," Kurjack says. "Finding sufficient water was an enormous challenge faced by the Maya, and studying water resources will help in understanding their agriculture and population distribution."

The satellite data can detect the major Mayan surface water sources, including small, scattered lakes, as well as aguadas, natural pools of water which the Maya often used for water storage, and cenotes, natural wells formed from collapse or erosion in the limestone shelf. Kurjack and Duller plan to study the means of water storage used by the Maya in different regions by mapping the natural opportunities for getting water and overlaying this map with a map of archaeological sites.

-more-

In the Yucatan, which has mainly seasonal surface water, the NASA researchers are comparing imagery from the wet and dry seasons to determine the distribution of surface water. Coupled with ground-based studies of how the climate has changed, the research will lead to a determination of how much water might have been available during Mayan times. Scientists could then determine which areas might have been optimal for agriculture, and how many people the land could have supported.

This, in turn, could help shed light on the periods of Maya decline. Some scholars believe the Maya may have exhausted the soil in attempting to support a large population. The Maya are thought to have practiced slash-and-burn farming, which leads to water run-off, erosion, and depletion of nutrients, unless the land is allowed to lie fallow for eight out of ten years. "They may have severely damaged their environment. Much as we do today, they appear to have sought short-term benefits, and created a long-term disaster," Kurjack said.

The researchers believe that locating surface water sources is an effective means of discovering new archaeological sites. "It's closely coupled. Where you find water, you usually find ruins," Duller says. The Landsat images show numerous apparent aguadas and cenotes, which must be confirmed by field investigation.

The NASA researchers had initially hoped Landsat would be able to detect ruins directly. They had thought vegetation growing on ruins would be weaker or more stressed, since they have poorer access to water, and thus appear in a different shade in the infrared images from surrounding vegetation. But the researchers found that in the Yucatan all vegetation appears highly stressed. Duller believes that radar imagery will be able to penetrate the dense vegetation covering many sites. If permission from the Mexican government can be obtained, he would like to use radar-equipped aircraft for further research.

The satellite imagery has been highly effective for locating cleared ruins. This capability is significant because much of the Yucatan is only now being mapped, and locating even excavated sites from the ground has been extremely difficult since the region is flat, thickly forested, and has few roads. "There were explorers in the Yucatan for a hundred years. Sites were discovered, lost to memory, and then rediscovered, named and renamed," Kurjack recalls. (Kurjack is now working with the Mexican National Institute of Anthropology and History, in their project to map all archaeological ruins in the Yucatan.)

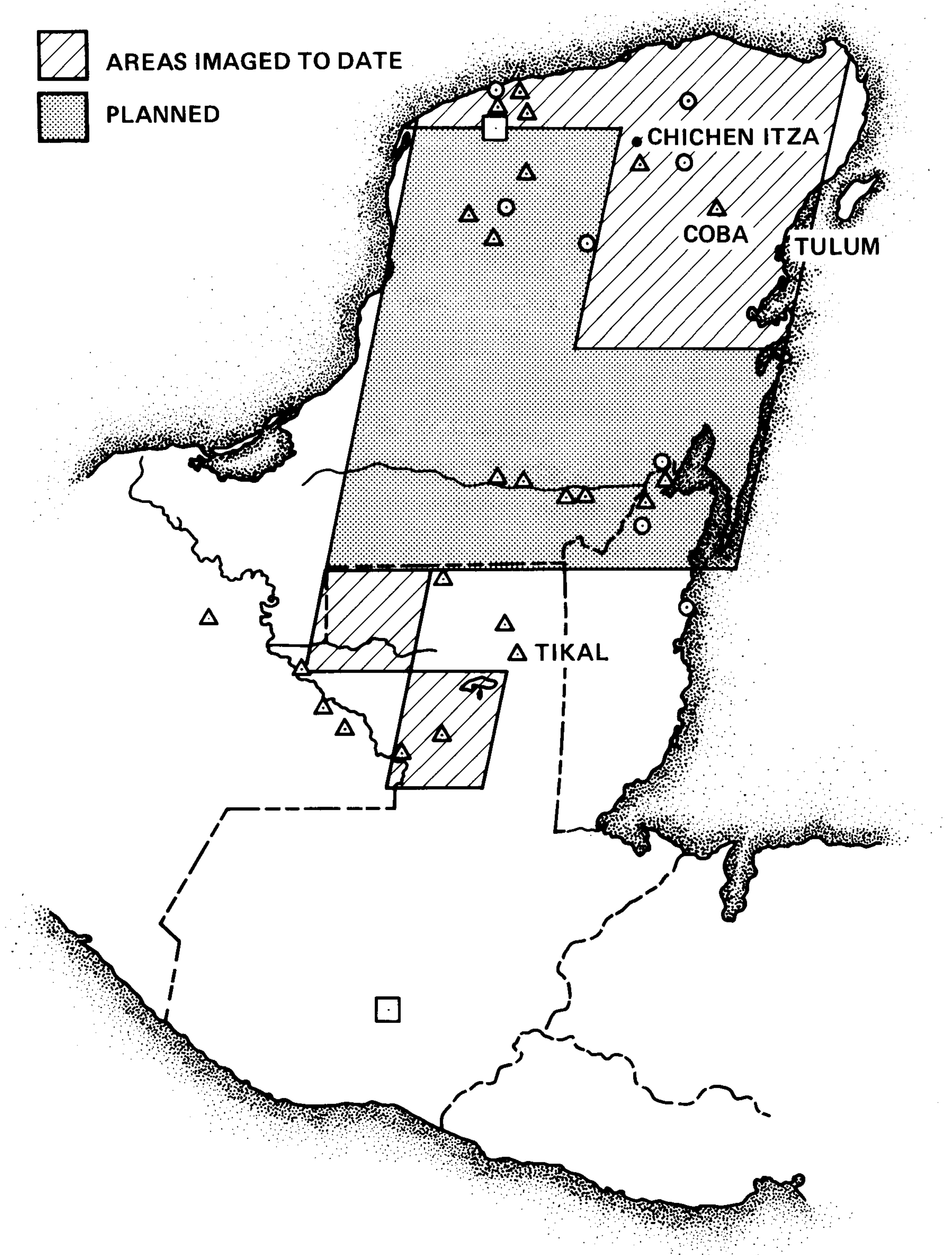
The Ames researchers have mapped large portions of the 62-mile raised road from Coba to Yaxuna, which is by far the longest of the many elaborate causeways built by the Mayas to connect ceremonial centers. Kurjack and Duller now plan to study the environmental setting of the Coba-Yaxuna road, particularly its location in relation to water sources and settlements.

The researchers stress that satellite data is highly valuable in archaeology not just for finding ruins, but for helping to understand the environment, and thus the civlization. "Archaeology is not just a glorified treasure hunt. It is the study of the relationship between human beings and their environment over time. Satellite technology is an extremely effective and inspiring way to study for archaeologists to study the environment," Kurjack said.

The Ames archaeology-remote sensing project stems from NASA's interest in demonstrating the applications of space technology to a wide variety of disciplines. The project also reflects NASA's growing emphasis on applying space technology to studying the Earth's ecosystem -- the problems involved in maintaining a stable, life-sustaining environment on Earth. "Environmental problems resembling today's were experienced long ago, on a smaller scale by the Mayas and other ancient peoples," Duller says. "By studying the Maya, we can better understand human interaction with the Earth system: how they adapted to the environment and its changes, and what changes they may have caused."

February 19, 1987

YUCATAN PENINSULA, MEXICO



LANDSAT SATELLITE IMAGERY OF THE NORTHERN YUCATAN PENINSULA

NASA-Ames Research Center

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Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

For Release:

Peter W. Waller 415/694-5091
Linda Blum
Patricia Long

Immediate

Release No. 87-08

NAS CAPABILITIES FACT SHEET

NAS is the world's most advanced and, in many respects, most powerful supercomputer system because it is a continuously evolving capability.

1. A basic requirement of NAS is always to acquire the fastest available supercomputer at any given time, provided it is at least four times more powerful than a computer already in place.

2. Requirements of the aerospace industry for increasingly advanced CFD are a continuing driver for NAS development and improvement.

3. NAS involves the use of the most advanced applications software. This means the most advanced understanding of the physics. It also means developing algorithms and other logic to map the problem onto the system. This operational software reflects both computer architecture and the problem's inherent nature.

4. NAS involves constant development and improvement of various types of major supporting equipment and systems for the supercomputers. These systems in themselves include advanced workstations, mass storage, graphics and communications, and other arrays of computer hardware and software.

-more-

5. NAS is housed in a large (90,000 sq. ft.) facility, specially designed and constructed with massive air conditioning, communications, and other special computer support facilities.

SPECIFIC NAS CAPABILITIES

1. The current central processor is the world's most powerful supercomputer (the Cray-2 with 256 million words of internal memory).

2. Number of workstations -- NAS has over thirty workstations, all connected directly to the central processor.

3. NAS is the only supercomputer system with software compatible workstations interacting locally and remotely located throughout the country. In addition to universities and other centers throughout the country, NAS is connected to all major U.S. aerospace companies.

4. Software -- NAS is the only system employing common operating external communications software for all components.

5. NAS is doing pathfinding work in advanced graphics, in advanced networking, and in new supercomputers.

FUTURE NAS OBJECTIVES

o Acquisition of the next generation supercomputer. To be acquired this year, 1987, the so-called HSP-2 (High-Speed Processor 2) will be four times faster than the current Cray-2.

o Achievement of supercomputer speeds of 4 billion computations per second in four years, and 10 billion computations per second within a decade. Current sustained supercomputer speeds are a quarter billion computations per second and 1.7 billion peak speeds.

o Faster communications nationwide using new fiber optic technology.

o More advanced graphics.

Advanced graphic displays do not replace numerical solutions. However, they provide a powerful tool for quick assessment of a given solution. In aeronautics, for example, it is frequently possible to assess the difference between a poor and good design entirely based on the computer graphic read-out.

o Improved mass storage.

i. e., large-volume, long-term storage of data, with rapid access.

o Research on advanced supercomputer architectures.

Various kinds of parallel processing schemes are currently promising.

o Research on parallel processing programs (software) of various types.

OTHER POWERFUL COMPUTER SYSTEMS

The Deparment of Defense, the National Security Agency, and the Department of Energy are acquiring supercomputers for nuclear fusion, weapons research, and allied work. Various university consortiums are also acquiring supercomputers.

A major part of the NAS research undertaking, as well as that of the Department of Defense, is to improve the supercomputer system itself (as well as to use it operationally in a range of advanced computation areas such as aeronautics design). Also, the NAS program works continuously with the supercomputer industry to produce the fastest and most capable hardware as soon as possible, and to acquire these new machines as early in the development cycle as possible.

SOPHISTICATION

The NAS charter and interests of its developers direct the majority of its work to aeronautics and spacecraft development (largely computational fluid dynamics). However, the NAS charter also calls for work in other scientific and technical disciplines of interest to NASA.

These include: astrophysics, weather and atmosphere modeling (Earth and other planets), computational chemistry, genetics, materials science, number theory, very-high-velocity fluid flow, artificial intelligence, and other physical and chemical problems. A number of these other areas of research are closely allied to fluid flow. Weather phenomena, for example, are almost identical, in principle, to air flow around a flight vehicle. Much the same can be said for many astrophysics phenomena.

Unlike a number of machines and systems currently under research and in development, the NAS system is a finished, operating product, and works on day-to-day "real-world" scientific and technical problems. In the case of aeronautics, it produces new wing designs, for example.

This means that a number of exciting, immediate results can be expected in the above fields. NAS produces product, not tentative or questionable solutions. This product may be "far out," like the results of a galactic collision, but is mainstream research performed with reliable, fully-developed hardware.

SOPHISTICATION AND ARTIFICIAL INTELLIGENCE

Computer development is going two ways: toward larger, faster systems (NAS), and toward "thinking machines" (artificial intelligence). Artificial intelligence (AI) systems are moving toward "fifth generation machines," able to sort out problems and decide which direction to go. (NASA is working on artificial intelligence systems for Space Station and other applications.)

However, it is important to recognize that the disciplines will rejoin. Large artificial intelligence systems ("electronic brains") will have the same requirements for analyzing, handling, scheduling and, finally, computing very large problems, very fast, with many variables and many ramifications as do current types of NAS work. For these "thinking machine" applications, the kinds of sophisticated systems and problem analysis capabilities being developed for NAS will be essential.

NASA News

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Space Administration

Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

Peter W. Waller 415/694-5091
Linda Blum, Patricia Long

For Release:

Hold for Release,
10:30 a.m. PST, March 9

Release No. 87-09

NASA'S NAS SUPERCOMPUTER SYSTEM GOES OPERATIONAL

NASA'S Numerical Aerodynamic Simulation (NAS) supercomputer system will go fully operational on March 9.

Advent of the NAS system, the world's most advanced and, in many respects, most powerful supercomputer system, marks a new era in many types of research.

With NAS, scientists and engineers will be able to "see" the airflow around a proposed new aircraft or spacecraft. They can watch "real" weather systems in action, or "real" galactic collisions. The computer system has for the first time the power to replace informed technical judgments with detailed calculations of previously uncalculatable, extremely complex phenomena. Such computational capabilty is a new development in scientific history.

The NAS system will perform a wide range of basic and applied research. Its primary use will be for pioneering research in aeronautics. Its ability to simulate actual aircraft flight in a computer will help insure continued national preeminence in aeronautics and advanced aircraft.

Other uses for the system include computational chemistry, weather modeling, astrophysics, and biological research. Part of the NAS charter is the serve as a pathfinder for major improvements in supercomputer systems.

-more-

Major NAS system features are:

o It is a continually evolving system;

o To always have the fastest available supercomputer system at any given time;

o Requirements of the aerospace industry for its output are a continuous driver for further NAS development;

o It uses the most advanced software, reflecting demands of the physics of problems, logic of the problem -- breakdown and computer architecture;

o Provision of the most advanced supporting systems, including the all-important graphics, work stations, communications, mass storage, etc.;

o A large, intensively-equipped supporting facility.

NAS is a national facility used by researchers at universities, in government, and the aerospace industry. A network using satellite and high-speed terrestrial lines allows off-site scientists at over 27 locations nationwide access to the system.

The NAS system is chartered to progressively incorporate the world's most advanced supercomputer technology. The system will always employ the two fastest supercomputers in existence at any given time as central computing engines. As faster processors are developed, the slower of the two current central supercomputers will be retired. The system also includes mainframe computers and a large network of graphic display workstations.

The NAS system is at present driven by the most powerful version of Cray Research's Cray-2 supercomputer, which has an enormous 256-million-word internal memory -- 8 times larger than those of previous supercomputers. The Cray-2, considered the world's most powerful fully-developed supercomputer, is capable of a sustained 250 million computations per second and top speeds of 1.72 billion computations per second.

-more-

In 1988, the NAS system's speed will be increased to a sustained one billion computations per second with acquisition of a second high-speed processor. A capability of ten billion computations per second is expected within a decade.

The exceptional speed and memory of the NAS system will allow scientists to simulate more complex configurations of aircraft and to more accurately approximate the Navier-Stokes equations, which physicists use to describe the flow of air around solid bodies. Numbers generated by the supercomputers can be converted into computer-generated pictures or movies that show flow phenomena.

Since in effect, aircraft configurations can be tested by "flying the aircraft in the computer," the system will allow study of numerous configurations of aircraft and propulsion systems and will reduce the time and cost involved in developing aircraft designs and wind tunnel testing.

NAS will be used to develop technology for the planned DOD/NASA National Aero-Space Plane, a craft which will take off from a runway, achieve sustained cruise at hypersonic speeds or accelerate directly into Earth orbit. Above Mach 7, wind tunnel testing for aerospace plane will be very difficult because of sheer scale and energy requirements for test equipment.

OTHER CAPABILITIES

1. NAS is the only supercomputer system with software compatible workstations, interacting locally and remotely, located throughout the country.

In addition to universities and other centers throughout the country, NAS is connected to all major U.S. aerospace companies.

2. NAS is the only system employing common operating system software (a single job control language) for all components.

-more-

3. NAS is doing pathfinding work in advanced graphics, in advanced networking, and in new supercomputers.

Future NAS objectives are:

o Faster communications nationwide using new fiber optic technology.

o More advanced graphics.

Advanced graphic displays do not replace numerical solutions. However, they provide a powerful tool for quick assessment of a given solution. In aeronautics, for example, it is frequently possible to assess the difference between a poor and good design entirely based on the computer graphic read-out.

o Improved mass storage.; i. e., large-volume, long-term storage of data, with rapid access.

o Research on advanced supercomputer architectures.

Various kinds of parallel processing schemes are currently promising.

o Research on parallel processing programs (software) of various types.

Current NAS projects include designing a crew escape system for the space shuttle, and redesigning the shuttle's main engine for better efficiency, allowing greater payloads to be carried into orbit.

NAS also will be used to study aircraft motion at high angles of attack. During rapid maneuvering at extreme attitudes, loss of lift and control of an aircraft may occur.

NAS will be used for helicopter design, which involves complex flow field physics, since helicopter rotors are used for both propulsion and lift. The moving rotors also create wakes, which succeeding blades plough into, creating noise and limiting forward speed. Advanced helicopter design is so highly complex much work will have to wait until the next-generation supercomputer, currently referred to as HSP-2 (High Speed Processor-2), is available.

NAS also will be used to study corrosion and other effects of ambient oxygen on the surface of vehicles. The NAS studies will predict the effect of oxidation on different materials and surfaces.

Two current astrophysics projects focus on modeling the hydrological cycle and atmospheric circulation on Mars. A third project will model the formation and evolution of galaxies.

Advances in logic and memory chips have paved the way for superfast computing rates. But the rate of computation is limited by the time it takes for the impulses to pass from one chip to another. Theoretically, impulses can travel down a wire at speeds close to the speed of light. So packing chips close together with short interconnecting cables will produce fast computers. The Cray-2 achieves its super speed from closely packed chips. But crowding and high power build up heat in a small space, so the densely packed chips could damage each other. The Cray-2 is the first computer to have its chips totally immersed in an inert fluid that draws away excess heat. The fluid, which is the same substance used as an artificial plasma to replace human blood, is non-conductive and will not damage the chips. Earlier computers used forced air or other cooling systems to control excess heat buildup.

NAS is housed in a two-story 90,000 sq. foot facility which is equipped with an array of systems for the optimal functioning of computers. The structure has over 30,000 square feet of computer floor, including a main computer area of 15,000 square feet. To support this equipment and personnel, there is over 9.5 megawatts of power and 2,800 tons of cooling.

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February 27, 1987

NASA News

National Aeronautics and
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Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

For Release:

Peter Waller 415-694-5091
Linda Blum
Patricia Long

IMMEDIATE

Rel. No. 87-11

NASA SELECT PROGRAMMING

for Tuesday, March 10, 1987

1:00 p.m.-3:30 p.m. EST

(Satcom F2R, transponder 13,
C-band, freqency 39-60 MHZ.)

To: TV Editors

NASA's NAS supercomputer system will go fully operational on Monday, March 9.

This will mark a new era in many types of scientific and technical research. The NAS system for the first time has the power to replace informed judgements with detailed calculations in many scientific fields involving highly complex phenomena.

This means scientists can watch real airflow around proposed new aircraft or spacecraft, weather systems in action, or galactic collisions. This is new in scientific history, and should produce major findings.

NAS is a continuously evolving system, the world's most advanced. It currently does a quarter billion computations per second (cps), and this year will up this rate to a billion cps, with ten billion expected in a decade.

NAS is a national facility, located at NASA's Ames Research Center, Mountain View, CA. It will help maintain U.S. leadership in aeronautics, our current largest export (except agriculture). It will have a major role in design of the planned airfield-to-orbit U.S. aerospace plane, in computational chemistry, astrophysics, materials and biological research, genetics, and other disciplines.

A major Symposium will be held at Ames on the afternoon of March 9 to assess the significance of the NAS capability and of advanced computer systems in general. This will cover economic, scientific, and social consequences of advanced computation technology. Programming will include dramatic accompanying graphics.

Television transmission of the March 9, NAS Symposium will be delayed until Tuesday, March 10. Transmission will occur from 1:30-3:30 p.m. EST, March 10.

Stations, cable systems, and others can pick the programming off the satellite (Satcom F2R, transponder 13, C-band, frequency 39-60 MHZ). Networks and local stations in Washington, DC can come to television operation control at NASA headquarters. Feeds are also available at NASA Dryden, Johnson Space Center, JPL, and Kennedy Space Center.

For information on the NASA Select broadcast, contact Les Gaver, NASA headquarters, Washington, DC (202-453-8372).

SYMPOSIUM

Shaping the Future

A new era in scientific computing

Welcoming Address

William F. Ballhaus, Jr., Director, NASA's Ames Research Center

Introduction

Raymond S. Colladay, Associate Administrator for Aeronautics and Space Technology, NASA Headquarters

Speakers

Designing the Future in Aeronautics and Aerospace Transportation

Dean Thornton, President, Boeing Commercial Airplane Company

Supercomputing and the Blueprint for the Space Frontier

Thomas Paine, Thomas Paine Associates, Chairman, National Commission on Space

Technology and the Search for Extraterrestrial Intelligence

Bernard M. Oliver, Chief, Search for Extraterrestrial Intelligence (SETI) Office

New Tools for Visualizing the Future

Gary Demos, Whitney/Demos Productions
(Mr. Demos will show animated footage from major motion pictures generated by supercomputers.)

Human Aspects of the Revolution in Supercomputing

David Perlman, Associate Editor and Science Editor, San Francisco Chronicle

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NASA News

National Aeronautics and
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Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

Peter Waller
Linda Blum, Patricia Long

415/694-5091

For Release:

Rel. No. 87-12

IMMEDIATE

Fletcher News Opportunity

To Editors:

NASA's NAS supercomputer system will go fully operational on Monday, March 9.

This will mark a new era in many areas of research. The NAS system for the first time has the power to replace informed technical judgments with detailed calculations in many scientific fields which involve highly complex phenomena.

This means researchers can watch real airflow around proposed new aircraft or spacecraft, weather systems in action, or galactic collisions. This is new in scientific history, and should produce major findings.

NAS is a continuously evolving system, the world's most advanced. It currently does a quarter billion computations per second (cps), and this year will up the rate to a billion cps, with ten billion expected in a decade.

NAS is a national facility, located at NASA-Ames. It will help maintain U.S. leadership in aeronautics, our current largest export (except agriculture). It will have a major role in design of the planned airfield-to-orbit U.S. aerospace plane; in computational chemistry, astrophysics, genetics, and elsewhere.

Dr. James C. Fletcher, NASA Administrator, will be at Ames for events marking the NAS capability. He will be available for West Coast and other media to answer questions on such subjects as the U.S. Space Station, NASA, and space-related matters.

NAS press events begin with the 9:30 a.m. briefing, Bldg. 245. The opportunity to meet with Dr. Fletcher will be from 12:30 to 1:00 p.m., Monday, March 9, Auditorium, Bldg. N-258.

Reporters should come to the pass office at the NASA gate of Moffett Field, and will be directed from there.

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Release No. 87-13

THREE EXPERIMENTS SELECTED FOR COMET INVESTIGATION

Three experiments submitted by scientific teams at NASA's Ames Research Center, Mountain View, Calif., have been selected by an international panel of scientists for participation in the study of comets.

The Comet Rendezvous Asteroid Flyby (CRAF) mission, being considered for launch in the early 1990's, will be the first of the new Mariner Mark II series of spacecraft. It will rendezvous with a short-period comet several years after launch and fly with that comet from near aphelion through perihelion, a period of three to four years. The principal mission objective is to characterize the nucleus of the comet. During flight to the comet, the spacecraft would fly by an asteroid, allowing reconnaissance-type science to be conducted.

Ames' three CRAF proposals are: The cometary ice and dust experiment (CIDEX), thermal infrared radiometer experiment (TIREX) and an interdisciplinary scientist for exobiology (IDS).

CIDEX was proposed by Glenn Carle, Bonnie J. O'Hara, Sherwood Chang, Theodore Bunch and James Pollack, all from Ames, along with seven other co-investigators from various universities, industry and NASA. The CIDEX instrument is designed to capture and analyze dust, ices and gases evolved from the comet as the coma and tail develop during its pass around the Sun.

- more -

The TIREX experiment was proposed by Ames Drs. Francisco P.J. Valero, Jesse Bregman, Christopher P. McKay, Jeffrey N. Cuzzi and Michael W. Werner, along with two other co-investigators. TIREX will directly measure the thermal emission and the scattering of solar radiation from the comet. This will greatly enhance understanding of the radiative effects of thecomet and allow for refinement of comet energy budget models. Spectrally resolved observations of the comet also will provide information on the composition and particle size distribution of the coma dust.

The IDS for Exobiology was proposed by Dr. Christopher McKay. Exobiology is the study of those chemical processes and physical events that led to the appearance of life in the universe. Included is cosmic history of carbon and other biologically important elements, chemical evolution of the first biochemical systems and the early origin and evolution of life. McKay's role is to represent the scientific interest of exobiology throughout the mission. He will assist CRAF instrument teams and project science groups, and aid in CRAF flight data interpretation, to ensure that exobiology science objectives are included. McKay will also seek to determine the organic content of the nucleus; understand the distribution of the biogenic elements and their compounds in the nucleus and determine the dynamic evolution of the biogenic elements in the nucleus during approach to the Sun.

The Comet Rendezvous Asteroid Flyby (CRAF) mission study is managed by NASA's Jet Propulsion Laboratory, Pasadena, Calif.

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April 23, 1987

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Release No. 87-14

PIONEER 9 SPACECRAFT DEAD AT 18 YEARS -- ONE OF FIRST INTERPLANETARY PROBES

NASA's Pioneer 9 spacecraft, which has orbited the Sun for almost two decades, was declared officially out of operation today, after a final attempt to contact it was unsuccessful.

The last signal from Pioneer 9 was received on May 18, 1983. Over the next three years, controllers made a number of attempts to reach the spacecraft when equipment availability and the positions of the Earth, Sun, and spacecraft permitted, but they were unable to pick up a signal.

On March 3, 1987, in a last-ditch attempt to revive the spacecraft, engineers at NASA's Ames Research Center in Mountain View, Calif. used a wide variety of combinations of transmitters, antennas and receivers, including an especially sensitive receiver developed for NASA's Search For Extraterrestrial Intelligence. Eighty command sequences, totaling 270 comands, were transmitted to the spacecraft. However, no signal was detected.

The final attempt to reach Pioneer 9 came 18 years after it was launched, on November 8, 1968. The spacecraft had greatly outlasted expectations, since its required design lifetime was six months. "Pioneer 9 was a terrific spacecraft which hung in

-more-

there and sent us good data for years," said Pioneer Project Chief Richard Fimmel, of NASA-Ames.

Pioneer 9 was one of a fleet of four NASA spacecraft which have orbited the Sun since the late 1960's. Pioneer 9 and its sister spacecraft, Pioneers 6, 7 and 8, were among the earliest interplanetary probes (spacecraft which orbit or fly by solar system bodies beyond the Earth and Moon). Pioneers 6, 7 and 8 continue to function.

The solar-orbiting Pioneers made the first detailed, comprehensive measurements of the solar wind, solar magnetic field, and cosmic rays. Since the Sun is thought to be typical of many stars in the universe, the Pioneer data provided insights into stellar processes. Until 1972, the Pioneers also supplied practical data on solar storms which impact communications and power on Earth. The four Pioneers have rarely been tracked in recent years, since newer missions have required time on NASA's Deep Space Network antennas.

Like a tiny planet, Pioneer 9 circled the Sun 22 times, covering 11 billion miles. Its 297-day orbit ranged from within 70 million miles to 90 million miles from the Sun (just inside Earth's orbit). The 148-pound spacecraft sent 4.25 billion bits of data back to Earth during its operational lifetime. "We're sorry to lose Pioneer 9, but it had its day in the Sun," commented Pioneer engineer Robert Jackson.

Engineers speculated that Pioneer 9's demise could have been due to an electrical short-circuit caused by a worn-out part. A remote possiblity is that the spacecraft was hit by a meteor.

As they have aged, all four solar-orbiting Pioneers, which are solar-powered, have turned themselves off due to circuit overload when at their farthest from the Sun. However, until now, mission controllers had always been able to command the spacecraft back on by radio signal. Pioneer 9 will continue to orbit the Sun indefinitely, but in all likelihood will never again transmit data to Earth.

Pioneer 9's accomplishments include determining the structure and flow of the solar wind, the million-mile-an-hour stream of ionized gases which spirals out from the Sun. Pioneer 9 and the other solar-orbiting Pioneers also measured the twisted magnetic fields threading the solar wind, and the high-energy particle streams which follow the course of the magnetic field out from the Sun.

Before the Pioneer findings, the solar wind was thought to be a gentle, steady flow. Instead, though it is far more diffuse than any vacuum created on Earth, the Pioneers found a region of great turbulence, with fast-moving streams continually ploughing through slower ones, creating shock waves. "We found that interplanetary space is an exciting place," said Hal Collard of NASA-Ames, chief of science for Pioneers 6 - 9.

The Pioneers also studied the numbers and different types of cosmic rays and showed how they vary with the solar cycle. Masses of data on solar wind phenomena led to better understanding of the solar corona, from which the solar wind boils off into interplanetary space.

When positioned behind the Sun, the Pioneers helped predict solar storms, because they could see events on the solar surface up to two weeks before these became visible on Earth. These huge bursts of solar wind buffet and distort Earth's magnetic field, throwing circuit breakers and causing power black-outs. Such geomagnetic storms are also thought to trigger some of Earth's long-term weather. In the past, the Pioneers were used to predict solar storms for about 1,000 users, including the F.A.A., power and communications companies and the military.

During the Apollo lunar landings, the Pioneers provided hourly reports of solar activity to Apollo mission control. The information guarded against the unexpected arrival of intense showers of solar protons which could have been dangerous to astronauts on the Moon.

In August, 1972, during the most intense solar storm ever recorded, Pioneer 9 was fortuitously aligned with Pioneer 10, which was 132 million miles away, on its way to Jupiter. The two spacecraft measured the same masses of gas upstream and downstream, providing invaluable data for solar physics. Their findings showed that the gases lost half their speed but increased dramatically in temperature, indicating that the solar wind converts much of its motion energy into thermal energy. During the cataclysm, Pioneer 9 measured the highest solar wind speeds ever known.

The Pioneers, which paved the way for later interplanetary probes, were designed as rugged, relatively simple, spacecraft. Besides the early Pioneers in solar orbit, three other Pioneers continue to function well. Pioneers 10 and 11, which were the first spacecraft to pass through the asteroid belt and reach Jupiter, are now heading out to interstellar space on opposite sides of the solar system. Pioneer 12 continues to orbit Venus, as it has since 1978, sending back data on the planet's atmospheric circulation and cloud banks.

The Pioneers are managed by NASA's Ames Research Center, in Mountain View, Calif. They were built by TRW, Inc., of Redondo Beach, Calif.

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For Release:

Peter Waller
Linda Blum
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Immediate

NASA'S VENUS ORBITER TO BEGIN SIX WEEK STUDY OF COMET WILSON

NASA's Pioneer 12 spacecraft, orbiting Planet Venus, will begin soon six weeks of measurements of the newly-discovered Comet Wilson, as the comet streaks by Venus and arcs past the sun.

Controllers at NASA's Ames Research Center in Mountain View, Calif., will track use Pioneer 12 to track Wilson from March 14-21, then stop for ten days when the comet dips beneath the plane of the solar system and the spacecraft's field of view.

Pioneer 12 will resume observations on March 31 and continue until April 30. This period includes the comet's closest approach to the sun (perihelion) on April 20. The comet will be tracked for 20 hours a day during the observation periods.

Wilson, discovered in August 1986 by Christine Wilson, a PhD. candidate at the California Institute of Technology, is thought to be a fresh comet embarking on its first visit to the solar system. Fresh comets are of special interest to researchers because they have not been modified by the sun. These comets provide a better record of primitive conditions in the solar system.

Pioneer 12 will measure the rate of water evaporation from the comet's nucleus and the amount of carbon and oxygen emitted,

-more-

by studying the comet in the ultraviolet portion of the electromagnetic spectrum. The spacecraft's observations, the most extensive ultraviolet measurements of Comet Wilson, may also indicate the rate of rotation of the comet's nucleus. Added to Pioneer's data on other comets of varying ages, the observations will provide information on how comets change over time.

Fresh comets are thought to have an outer skin of carbon-bearing molecules. This skin is quickly lost upon exposure to the sun. By observing the rate of carbon evaporation and comparing it to the water evaporation rate, the Pioneer experimenters will gather detailed information about this process.

The experimenters will also look for carbon-rich and water-rich outbursts, which would indicate the surface of the comet's nucleus is patchy, not uniform. If the nucleus is not competely smooth, the researchers will be able to deduce the nucleus' rotation rate by noting how often these outbursts reappear.

The Wilson observations will mark the fourth time Pioneer 12, which has observed Venus since 1978, has studied a comet. The spacecraft studied Halley in 1986, Giacobini-Zinner in 1985 and Encke, a comet near the end of its life, in 1984. Pioneer will observe Encke again when the comet re-enters the inner solar system in June and July 1987.

"Combining the data will provide an opportunity to study comets in all stages of life. We'll have a unique and consistent data set on comets of differing ages, from which we can study the activity and compositional changes as comets evolve," said chief experimenter Ian Stewart of the University of Colorado.

Pioneer's study of Wilson will be the only extended ultraviolet measurements of the comet. Ultraviolet measurements cannot be made from Earth's surface because the atmosphere's ozone layer blocks out much ultraviolet light. Earth-orbiting spacecraft, such as the International Ultraviolet Explorer, will scan Wilson with highly-developed instruments, observing a broad range of chemicals, but these craft will only be able to make brief observations, since they cannot take time from their primary missions to to observe stars and galaxies. "Our instrument is somewhat cruder, but we will be able to make far longer measurements, enabling us to see important patterns and variations over time," Stewart said.

John Dyer, of the Ames Pioneer project, said that because the comet's orbit is close to the region normally tracked by Pioneer-Venus, the spacecraft will need to be turned just 10 degrees to make the observations, thus using only a minimal amount of the orbiter's precious fuel supply. "Wilson's position is very fortuitous. It's an excellent opportunity to observe a new comet near perihelion,"Dyer said.

Scientists do not yet know -- and may never learn -- if Wilson will ever return to the solar system. So far, the comet's orbit has traced an almost exact parabolic curve; if the orbit remains parabolic, the comet will never again enter the solar system. If the orbit turns out to be elliptical, the comet may return periodically.

Millions of years ago, Wilson may have been perturbed by a passing star or a galactic gravity wave, and shaken from Oort's cloud, the hypothesized, vast array of comets which scientists believe circles the sun billions of miles outside the solar system.

Scientists believe comets to be remnants of the primordial cloud from which the solar system condensed. Cometary dust and gases are thought to have been driven to the outer reaches of the solar system by sunlight's pressure soon after the Sun and planets formed. Comets, composed mainly of water-ice, dusty and rocky material, are thought to be "celestial fossils" which can provide unique information about the early solar system. Recently, scientists have come to believe comets also carry a record of activity in the outer solar system -- particularly, the galactic cosmic rays which act on comets' outer layers. Comets can thus also tell about conditions in the galaxy.

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March 12, 1987

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Donald G. James 415/694-5091

For Release:
IMMEDIATE
3-23-87

Release No. 87-19

NASA AMES TO BUILD MOCKUP OF PROPOSED PRIVATE SECTOR SPACE LABORATORY

NASA's Ames Research Center, Mountain View, CA, will expand its ability to test new space systems by building a full-scale mockup of the Industrial Space Facility (ISF), a proposed low earth orbiting commercial laboratory. The ISF mockup is targeted to be completed in May 1987.

The ISF is being developed through a partnership between Space Industries, Inc. of Houston, Texas and WESPACE, Inc., a subsidiary of Westinghouse Electric Corporation, of Pittsburg, Pennsylvania. It is currently manifested for a Shuttle launch in 1992.

Space Industries, Inc. President, Dr. Maxime Faget, in a letter to Ames Director Dr. William F. Ballhaus, Jr. offered to provide the information and materials necessary to build the full-scale Industrial Space Facility mockup. In accepting the offer Ballhaus said, "the ISF mockup will be augmented and outfitted to accommodate experiments in the area of Autonomous Space Systems." Ballhaus said the mockup also will be used for other areas of research undertaken at NASA Ames. Dr. Faget said, "Space Industries looks forward to a meaningful working relationship with Ames and furthering the NASA Center's research goals."

The mockup will provide a realistic work environment for researchers to test new systems and equipment. Research using the low earth orbiting Industrial Space Facility could lead to new technologies and systems for NASA's proposed Space Station.

NASA Ames intends to display part of the completed mockup to the general public, providing a dynamic exhibit of Ames ongoing research within the ISF.

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NOTE: Space Industries Partnership is issuing a similar release. For further information please contact Mr. James Calaway, Vice President, at (703) 979-7915.

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Peter Waller
Linda Blum
415/694-5091
Release No. 87-23

Hold for Release
April 7, 1987
10:00 a.m. PST

AIRBORNE OBSERVATORY SET TO STUDY COMET WILSON AND SUPERNOVA

Officials at NASA's Ames Research Center, Mountain View, Calif., have announced that NASA's C-141 Gerard P. Kuiper Airborne Observatory will leave for Christchurch, New Zealand, on April 8 to study two newly-discovered astronomical objects.

The Kuiper astronomers will observe Comet Wilson as Wilson swings by the sun on its first trip to the inner solar system. In a late addition to the planned comet mission, researchers will study the brilliant supernova discovered in the southern hemisphere on February 24. The Kuiper is scheduled for seven research flights between April 12 and April 27 to study Comet Wilson and the supernova.

The Kuiper observatory, which is mounted in a modified Lockheed C-141 Starlifter jet transport aircraft, is fitted with a 36-inch-diameter telescope. The Kuiper is a national facility operated by NASA-Ames, and is regularly used for studies of star formation and evolution and for planetary science.

The Kuiper will make the only airborne infrared observations of the comet and supernova. The aircraft flies at 41-45,000 ft., above 99 % of the atmosphere's water vapor, which attenuates infrared signals.

Kuiper astronomers will study the intensity of the supernova's infrared emissions, and also the level of ionization of the enormous cloud of gas ejected by the supernova. In addition, they will look for evidence the supernova has begun to produce dust, and they will study dust formed by the star before it exploded into a supernova.

If the gas cloud has expanded enough to become transparent, they may be able to see into the supernova's core. Heavy elements are forged within the super-hot cores of supernovae. Iron, cobalt and nickel may be detectable in the Kuiper's infrared range. However, researchers do not know whether the core will be accessible, since the behavior of supernovae is not well-understood. "We don't know what to expect," said astronomer Jesse Bregman of NASA's Ames Research Center, in Mountain View, Calif.

"We're looking for serendipidity," said Lawrence Caroff of NASA-Ames, project scientist for the Kuiper. The Kuiper may return to New Zealand later this year and in 1988 to observe the supernova at later stages of development.

The Kuiper astronomers believe they may be able to detect such gases as methane, ammonia and hydrogen sulfide on Comet Wilson. These "parent molecules" are thought to be major components of comets but have never before been directly observed. Astronomers will also make highly detailed studies of the comet's water and dust emissions.

The Kuiper's observations of Wilson will provide an important complement to its study of Halley's Comet in 1985-86. Wilson is thought to be a fresh comet on its first voyage to the sun, while Halley is a middle-aged comet, modified by the sun on many visits. The combined findings will help researchers understand how comets evolve over time and exposure to the sun.

On its first comet mission, in December, 1985, the Kuiper was the first probe to definitively detect water on a comet, a complex measurement which marked a milestone in comet research.

Using the Fourier Transform Spectrometer, an extremely sensitive, high-resolution instrument developed at the University of Arizona, researchers will look for "parent molecules," such as water, which compose the comet. In the past, cometary composition was inferred from measurements of "daughter molecules" created by the action of solar radiation on the comet. (Water, for example, was inferred from hydrogen and hydroxyl molecules.)

Water and carbon dioxide were the only specific parent molecules detected on Halley. However, because Wilson is a fresh comet, it is expected to have a greater abundance of light, volatile parent molecules, which quickly escape to space upon exposure to solar radiation.

The Kuiper mission has an "excellent chance" of detecting methane in Comet Wilson, according to experimenter Harold Larson of the University of Arizona. Finding ammonia and carbon monoxide is "more chancy," Larson said, because the amount of these substances which might be present in the comet is not well-understood.

Researchers will also make a detailed study of the comet's water, including several measurements which have not been done before. The Arizona instrument's sensitivity will permit study of the ratio of ortho water to para water. These are two kinds of water which differ according to the temperature at which they were stored as ice in the comet's nucleus. The ortho/para ratio can be used as a "remote thermometer" to help determine the temperature of the comet's ice.

Knowing the temperature of the ice will offer clues to where the comet resided before journeying to the inner solar system. Comets are thought to orbit the sun in a massive cloud in the outer solar system. A low ice temperature would suggest that this cloud is far beyond the planets. "We're interested in seeing whether there's structure in the solar system beyond

Pluto," Larson said.

Researchers will look at water in the transitional state as it goes directly from a solid to a gas, when released from the ice in the comet's nucleus. By looking for fragments of ice crystals released from the comet, they hope to learn whether water leaves the ice primarily as crystal fragments or as single molecules. "For the first time, we'll gain some understanding of the mechanism by which the solid state breaks down," Larson said.

A second team of astronomers will study the comet's dust. Experimenters will use the Faint Object Grating Spectrometer, a sensitive, low-resolution instrument, developed at NASA-Ames, which can simultaneously observe a wide spectrum of molecules.

Using the Ames instrument, experimenters found the dust on Halley's Comet to be a broad mixture of silicates similar to the dust in the interplanetary medium. This supports the theory that interplanetary dust comes from comets. They will now study Comet Wilson to determine if it has the same dust composition as Halley.

Comet Wilson will be studied just before and after its closest approach to the sun (perihelion) on April 20. The comet will be 111 million miles from the sun and 72 million miles from the Earth on that date.

Wilson was 276 million miles from Earth when discovered in August 1986, by Christine Wilson, a graduate student in astronomy at the California Institute of Technology in Pasadena.

The supernova, known only as "1987A," was discovered by Ian Shelton, a Canadian astronomer working in Chile, on February 24. The massive stellar explosion, located 170,000 light-years away, actually occurred 170,000 years ago, in a small galaxy neighboring the Milky Way, called the Large Magellanic Cloud.

The closest supernova to Earth in four centuries, it has given astronomers the first opportunity to make detailed observations of this crucial phenomenon.

April 2, 1987

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Release No. 87-23

MCDONNELL DOUGLAS SELECTED FOR CONTRACT NEGOTIATION

NASA's Ames Research Center, Mountain View, Calif., has selected McDonnell Douglas Corporation, McDonnell Aircraft Company (McAir), St. Louis, Mo., for final negotiations leading to award of a cost-plus-fixed-fee contract. The 3-year contract has a proposed value of approximately $10 million.

McAir will equip NASA's F-18 high-alpha research aircraft with a thrust vector control system (TVCS) about the pitch and yaw axes. The TVCS, which supports NASA's High Angle-of-Attack Technology Program, will have an easily programmable research flight control system, allowing research into flight control concepts employing various blends of aerodynamics and thrust vector control at subsonic and high alpha flight conditions.

The contract will be performed at McAir's St. Louis facility and the NASA Ames-Dryden Flight Research Facility, Edwards, Calif. Work will begin approximately June 1.

The Northrop Corp., Aircraft Division, Hawthrone, Calif., also bid for this contract.

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May 6, 1987

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Peter Waller
Linda Blum
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PIONEER 12: WILSON A LARGE, ACTIVE COMET

Comet Wilson, which this spring made its first and last visit to the inner solar system, is a large and highly active comet, according to findings from NASA's Pioneer 12 spacecraft. One of the first fresh comets to be studied in depth, Wilson appeared strikingly different in gas composition from older comets, Pioneer 12 found.

Pioneer 12, in orbit at Venus, recently completed a six-week ultraviolet study of Comet Wilson.

Ian Stewart of the University of Colorado, chief experimenter for Pioneer's comet study, estimated that Wilson's nucleus is three miles in diameter. This would mean Wilson is "quite a sizable comet," Stewart said, larger than many previously studied comets such as Kohoutek. Halley, a very large comet and the only comet whose nucleus has been measured directly, was found to be nine by five miles wide.

As it reached its closest approach to the sun on April 20, Wilson produced as much water as Halley did at the same distance in 1985. Wilson ejected eight tons of water per second at 111 million miles from the sun. This is substantially more than most comets produce. As a fresh comet, Wilson was expected to produce more water relative to its size than older comets, which have a less active surface.

Wilson gases were far richer in carbon than older comets. Pioneer found Wilson to have more than twice as much carbon as Halley as a percentage of its constituents. While Halley's gas composition was 87 % water, 10% carbon monoxide, Wilson appeared to be 67 % water, 33 % carbon monoxide. The finding supports the theory that fresh comets have an outer skin of volatile molecules such as carbon monoxide. This skin is thought to be quickly lost upon exposure to the sun.

Pioneer's obervations indicate that Wilson's water production rate held steady as the comet approached the sun. Most comets increase water production as they near the sun's heat. Wilson's failure to increase production suggests that some of its outer skin of volatiles escaped early, leaving less active areas exposed.

Pioneer found that Wilson produced more than twice as much water as NTT (Nishikawa-Takimizawa-Tago), another comet which Pioneer observed on April 8. NTT's lesser activity suggests that it may be smaller as well as older than Wilson.

From its trajectory, scientists originally thought NTT might be a fresh comet. But Pioneer found that NTT is about 89 % water, 11 % carbon monoxide (similar to Halley). On that basis, Stewart predicted that NTT had been to the solar system before, losing some of its volatiles. When NTT left the solar system in April, its orbit in fact proved to be periodic.

Wilson and NTT were the fourth and fifth comets to be studied by Pioneer 12, which has orbited Venus since 1978. Previously, Pioneer studied studied Halley in 1986, Giacobini-Zinner in 1985 and Encke in 1984. "We'll have a consistent set of data on comets of differing ages, from which we can study how comets change as they evolve," Stewart said. Pioneer observed Wilson from March 14 to March 21 and from March 31 until April 30.

Wilson was discovered in August 1986 by Christine Wilson, a graduate student in astronomy at Caltech. NTT was discovered in January 1987 by the three Japanese astronomers for whom it is named.

- end -

June 1, 1987

NASA News

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Peter W. Waller 415/694-5091

For Release:
6/8/87
Immediate

Release No. 87-27

To editors:

The world's largest wind tunnel at NASA's Ames Research Center, Mountain View, Calif., will reopen on Wednesday, June 17, 1987.

Power of the tunnel has been increased from 36,000 to 135,000 hp, and top test speed from 230 to 345 mph.

The "40 by 80" foot tunnel, so named for the size of its test section, is large enough to test full-scale aircraft, and is a major asset for U.S. aircraft research and the industry. Aerospace is the largest earner of foreign exchange for the U.S. except agriculture.

A news briefing on planned uses of the powerful new tunnel, including descriptions of the vertical take off and other advanced aircraft it can test, will be held at 10 a.m. on June 17.

Reporters will be able to visit the test section, motor drive areas, and the reinstrumented control area. Those attending should come to the NASA gate of Moffett Field, and will be directed from there.

The 40 by 80 was constructed in 1944, and has been used to test most of the nation's important aircraft for the last forty years, including the shuttle and other supersonic designs. For the critical landing and takeoff phases of flight, all aircraft must pass through the tunnel's 0 to 345 mph speed regime. The new facility is expected to last another forty years.

June 8, 1987

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Peter W. Waller 415/694-5091
Ronette Canada

For Release:

June 17, 1987, 11:00 a.m. PDT

Release No. 87-28

BIG WIND TUNNEL TO REOPEN

The world's largest wind tunnel, at NASA's Ames Research Center, Mountain View, Calif., will reopen on June 17, 1987, with greatly increased test capabilities after undergoing major modifications.

The Center's 40-by-80-Foot Wind Tunnel (the world's largest), so called for the size of its test chamber in cross-section (height by width), was constructed in 1944 and has been used to test most of the nation's important aircraft for the last forty years. The "40-by-80" is large enough to test many full-scale aircraft. Full-scale testing always produces the most accurate aircraft research results.

Before modification, the big tunnel was powered by six-6,000 horsepower electric motors which generated airspeeds of up to 230 mph. It now has six-22,500 hp motors. This additional power increases the tunnel's drive power from 36,000 to 135,000 hp and has pushed its top test speed from 230 mph to 345 mph.

The 40-by-80-foot tunnel has been important in full-scale testing of civilian and military aircraft, including concepts such as advanced fighters, supersonic and subsonic transport aircraft, vertical or short takeoff and landing aircraft and rotary wing craft.

-more-

Sales of aerospace products abroad have long been the largest earners of foreign exchange for the U.S. except agriculture. The major improvements in this unique national facility will be important to both the industry and the country.

With the increase in size and speed of vertical lift vehicles, such as helicopters, and other aircraft developments, a more extensive research facility than even the improved "40-by-80" was necessary.

In order to meet this need, the closed-loop 40-by-80-foot tunnel has been converted to two tunnels which will share a common drive system.

A second "straight through" structure with a test section of 80-by-120-feet has been added to the old "40-by-80" (see diagram). The overall renovation project, which will include both tunnels, is known as the National Full-Scale Aerodynamics Complex (NFAC). Total cost of modifying and constructing these new facilities will be $122.5 million.

During NFAC development testing in December 1982, the slippage of a mechanical linkage in a vane set resulted in extensive damage to the facility which delayed completion. The damage has now been repaired and the redesign resulting from the accident will make the two-tunnel NFAC Complex more efficient than before.

On June 17, the first phase of the NFAC Project, the redesigned 40-by-80-Foot Wind Tunnel with greatly enhanced speed capabilities, will be ready for operation. The second phase, which includes the new "straight through" leg with its 80-by-120-foot test section, is expected to be complete in late 1987.

Modifications to the improved "40-by-80" include the following: 1) introduction of a 6-inch acoustic liner in the test section to reduce noise and aid in acoustic testing of helicopters; 2) automated fan drive and model support controls to increase test productivity; 3) upgraded data acquisition system with an increased number of data collection channels; 4) new electronic model force measurement system to provide more reliable measurements of overall aerodynamic forces; 5) a new air exchanger that releases hot air from the tunnel circuit and brings in cool air, allowing the tunnel to operate for longer periods of time; and 6) new corner flow turning vanes to reduce required drive power and maintain high test section flow quality.

Construction of the 40-by-80 was completed early this year. Extensive testing through the full operational envelop are now complete and test section flow calibration is in progress.

The repowered tunnel will operate much as it has since 1944 with air being driven around a closed loop through the 40-by-80-foot test section, but now at the higher top speed of 345 mph.

The facility will be important in low-speed testing of aircraft with engines running. And since all aircraft must pass through this speed range during takeoff and landing, the tunnel promises to be as useful in major projects of the future as it has been for the last forty years.

Results of such studies can then be used in an attempt to reduce aircraft noise during takeoff and landing, develop high-lift systems to reduce takeoff and landing distance, improve airplane flight performance in congested terminal areas, and develop new high-speed rotorcraft concepts.

NFAC's second phase, the new 600-foot long structure with a test section 80-by-120-feet in cross section, will receive air through an intake 360 feet wide and 130 feet high. Air traveling at 115 mph will pass through the test section and drive system and be released through vanes which are located in the south wall of the 40-by-80-foot facility. The two tunnels cannot be operated simultaneously since both share a common drive system. However, there is full access to the 80-by-120-foot test section during closed-circuit operation allowing for model preparation and checkout there prior to tunnel testing.

# # #

June 17, 1987

Illustration caption: Conceptual view of NASA-Ames' National Full-Scale Aeronautics Complex (NFAC)

As shown in the small diagram, the NFAC facility is two tunnels, powered by one set of motors and drive fans. When the 40-by-80-foot test section is used, tunnel air goes round the circuit in a continuous loop. When the larger 80-by-120-foot test section is operating, air is pulled in through the big, horn shaped inlet, flows down one side of the loop and back to the outside.

In the larger drawing, the three cutaways show the 40-by-80-foot test section (top), the 135,000 horsepower tunnel drive fans (center), and the 80-by-120-foot test section in the big horn. While one tunnel is running, models will be set up in the other tunnel, and vice versa. These tunnels are large enough to test full-scale aircraft with their engines running.

NASA News

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Peter W. Waller 415/694-5091

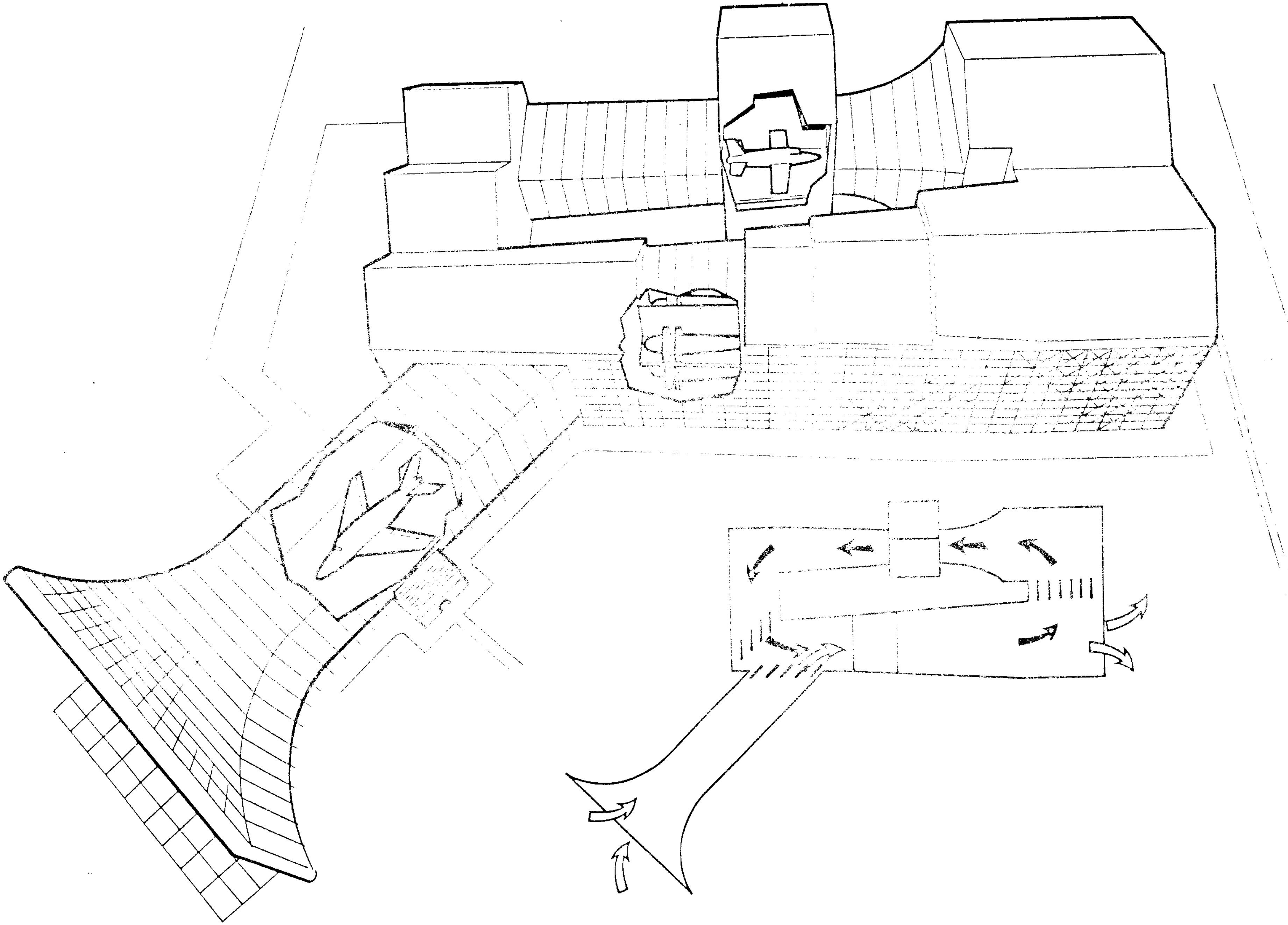
For Release:
June 17, 1987, 11:00 am PDT

Release No. 87-28A

PLEASE NOTE!!

The drawing on the reverse was inadvertently omitted from Release 87-28 - "BIG WIND TUNNEL TO REOPEN." The drawing should be included with the release.

# # #



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For Release:

Immediate

Release No. 87-32

NASA SCIENTIST BELIEVES A TENTH PLANET MAY EXIST

A tenth planet may exist beyond the known solar system. If it does, it must travel in an orbit at nearly right angles to the orbits of the known planets -- an orbit so elongated that it only nears the Sun and known planets every 700 to 1000 years, according to NASA scientist Dr. John Anderson.

His conclusion was first put forward in a book, "The Galaxy and the Solar System", published by the University of Arizona Press. It follows examination of long-term astronomical measurements, together with the absence of gravitational effects of a tenth planet on the Pioneer 10 and 11 spacecraft. Pioneers 10 and 11 are in the far outer solar system. The two Pioneers represent a uniquely sensitive measuring system for gravity effects. Anderson, of NASA's Jet Propulsion Laboratory, Pasadena, Calif., is principal investigator in celestial mechanics for the Pioneer spacecraft, which is managed by NASA's Ames Research Center, Mountain View, Calif.

- more -

Astronomers have long sought a large planet or other object beyond the orbits of Neptune and Pluto. Data exist on orbits of the planets to indicate that some kind of celestial object has affected the orbits of the outer planets. Until 1978, that object was thought to be Pluto. However, Dr. James Christy, of the U.S. Naval Observatory, found a moon around Pluto and determined that neither the planet nor its moon were massive enough to cause the long-observed waverings in the orbits of the outer planets. Anderson believes some other object must be responsible for this phenomena.

Anderson says between 1810 and 1910, during which measurement techniques were comparable to modern astronomical standards, evidence for an additional solar system body was strong. Yet the Pioneer findings have shown none of these effects.

This has caused experts in the field of planet-orbit measurement (celestial mechanics) to reexamine Anderson's interpretation of the long record of orbit data.

Anderson has reviewed many types of orbit measurements taken over a period of almost 2 centuries. His reinterpretations of these data now appear to show that, from the present back as far as 1910, all types of measurement techniques have failed to show any unexplained outer planet variations. This despite the fact that most orbit experts had long assumed that these well-known effects were continuing into the present century.

Long time periods are required to reach final conclusions about the very small effects on planet orbits because the outer planets take a very long time to orbit the Sun. Therefore, measurements of small position drifts in orbital arcs take decades. Uranus, for example, circles the Sun once every 84 years and Neptune once every 165 years.

Anderson maintains that the best explanation for an object very likely to have been there for at least 100 years, and then disappearing is a "planet" on a greatly elongated orbit. His data also tends to strengthen the idea that some kind of tenth planetary body may have caused the cataclysmic comet impacts some scientists believe are responsible for periodic mass extinctions, including that of the dinosaurs.

Anderson's surveys of theories for additional solar system bodies to explain first the apparent presence and then the absence of such a body have covered both "planets" and "stars," including mini-sized brown dwarfs. One of the current theories, which he feels fits the data quite well, is that of a planet whose orbit is tilted at almost right angles to the orbits of the other planets. In one dimension, this orbit might be from 10 to 20 billion miles across.

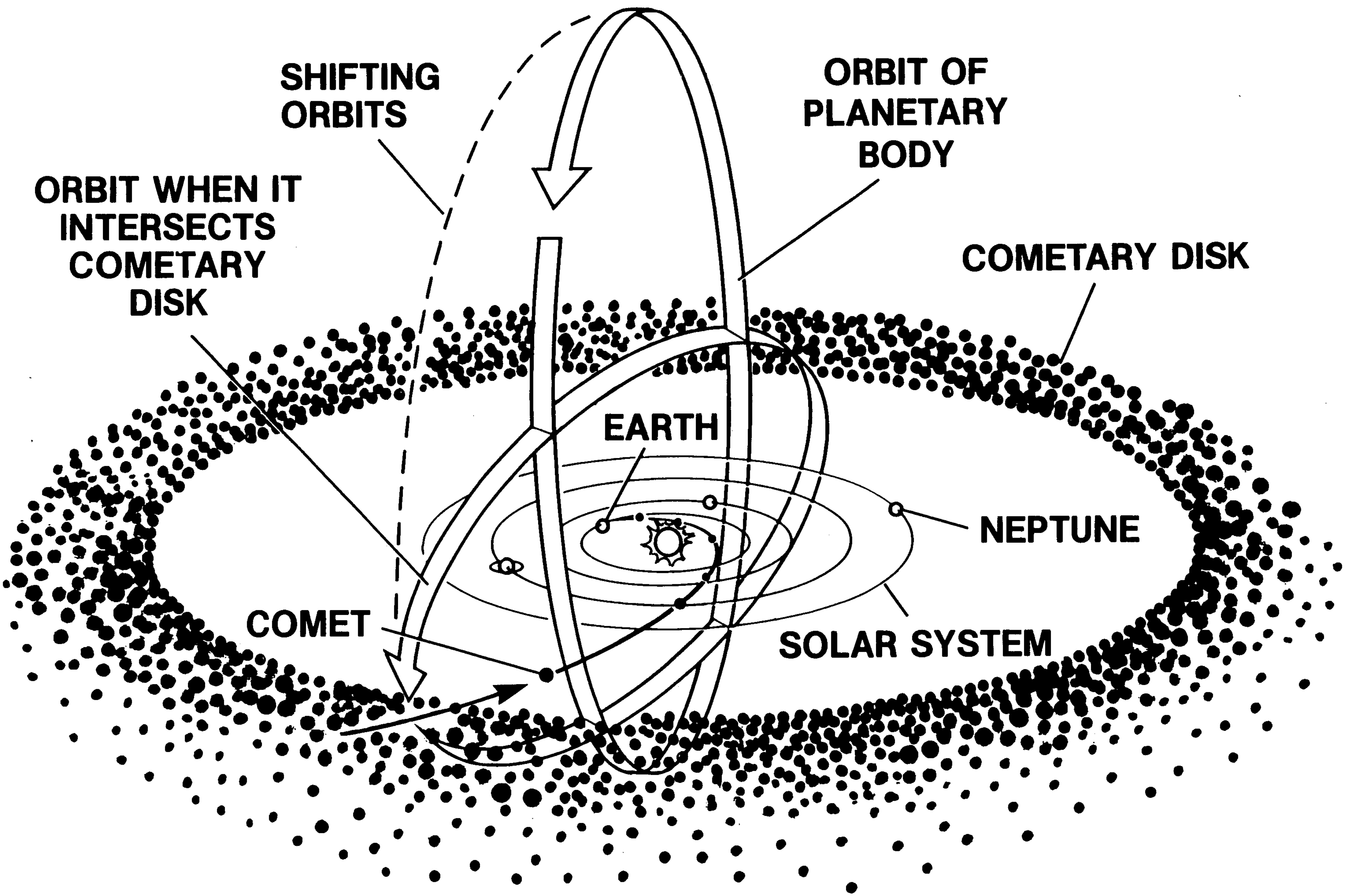
Anderson tracks the Pioneers to seek undiscovered heavenly bodies (and in another research area to look for gravity waves). The Pioneers are good indicators of the gravitational pull of celestial objects because the spacecraft generate almost no forces of their own which affect their trajectories. They are stabilized by their own spin, rather than the thrusts of control jets, and like tiny planets, they float free in the gravity fields of the solar system planets. Unexpected changes in their velocities would show the presence of an uncharted star or planetary object. Because their trajectories move them rapidly outward from the Sun and because of precise radio tracking, they are very exact gravity sensors.

NASA's Deep Space Network (DSN) telescopes, located in Madrid, Spain; Canberra, Australia; and Goldstone, Calif., transmit a signal to the Pioneer spacecraft and then measure the Doppler shift in the wavelength of returning signals. The faster the spacecraft pulls away from the Sun, the longer the wavelength the DSN receives. According to Anderson, "Two-way Doppler tracking gives us the best tracking data we could obtain." It is accurate to 1 millimeter per second.

In 3 years of precise measuring, Anderson has found no gravitational effect on Pioneers 10 and 11 which cannot be explained by the known nine planets. His review of planetary orbit data appears to show that this has been the case for the past 75 years. But Anderson believes that the data gathered between the 17th and early 20th centuries, showing orbit irregularities, is valid. He suggests that his own negative data means that whatever perturbed the orbits of outer planets is now either a huge distance from the Sun or is orbiting on the side of the Sun opposite Uranus and Neptune.

# # #

June 26, 1987


SHIFTING ORBITS
ORBIT OF PLANETARY BODY
ORBIT WHEN IT INTERSECTS COMETARY DISK
COMETARY DISK
EARTH
NEPTUNE
COMET
SOLAR SYSTEM

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For Release:

Peter W. Waller 415/694-5091

Immediate

Release No. 87-33

NOTE TO EDITORS

Some indirect but significant evidence for the possibility of a far-distant tenth planet of the solar system has come from the work of Dr. John Anderson, celestial mechanics experimenter for the Pioneer 10 and 11 spacecraft. The Pioneer project is managed by NASA's Ames Research Center, Mountain View, Calif.

Because they are stabilized by their own spin, and float freely in the gravity fields of the planets, Pioneers 10 and 11, two and four billion miles from the Sun respectively, are uniquely sensitive to even minute gravity effects of planetary bodies.

A news briefing to outline Anderson's significant chain of findings will be held Tuesday, June 30, 1987, at 10:00 a.m.

Reporters should come to the NASA gate of Moffett Field.

Photographs and videotape of the Pioneers and outer solar system scenes will be available to news media.

June 26, 1987

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Peter W. Waller 415/694-5091
Linda Blum

For Release:

Immediate

Release No. 87-34

NASA BEGINS MAJOR RESEARCH EFFORT IN ARTIFICIAL INTELLIGENCE

NASA has begun an initiative to apply artificial intelligence technology to space exploration and to conduct basic research in artificial intelligence. A new division has been organized at NASA's Ames Research Center to spearhead the work.

Working with other NASA centers and with private industry, Ames' Information Sciences Division will develop automated systems for all phases of space missions, from launch to mission control and on-board operations. The U.S. space station will have advanced AI automated systems controlling many on-board functions.

Applying AI technology will advance spacecraft performance and safety and will free astronauts from routine "housekeeping" chores so they can spend more time on scientific research.

For unmanned missions, Ames researchers will develop technology for intelligent agents -- autonomous systems, including intelligent robotic systems -- that can function for extended periods of time without human intervention. These will be important for a Mars rover, lunar base or in any environment potentially hostile or expensive to the maintenance of human life.

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Artificial intelligence will be used because this computer technology allows for "machine reasoning," enables rapid processing of massive amounts of data, and can function when there are uncertainties in the data. In AI, symbols rather than numbers are used to represent information, providing for great flexibility and abstraction of information. Rules (heuristics) structure the information, rather than the simpler yes/no algorithms used in numerical computer systems. At NASA-Ames, researchers will develop systems that can draw inferences, reason, learn from the environment, and correct errors.

The Ames Information Sciences Division has developed from the Ames' Information Sciences Branch, established in 1984. The division now has three branches and 60 full-time personnel.

A major thrust of the research will be systems integration -- establishing methods for two or more computer systems to communicate. "Networking among three or more computers is vital in highly complex environments such as the space station," said Anne Sitterud of NASA-Ames. For example, if a computer controlling temperature makes a change, a computer controlling the power system might also have to make an adjustment. To date, Ames researchers have analyzed two different communications protocols. Researchers are also working on systems integration and architecture within multiprocessors, to combine symbolic and numeric processing.

In addition, Ames researchers are working to develop machines that can recognize images and patterns (visual information, before it becomes digitized), which is the fastest way machines can absorb large amounts of data. The machines must be able to recognize and extract unique information, and find similarities.

In applying AI technology to ground operations systems, Ames will be working closely with other NASA centers. Researchers at Ames and Kennedy Space Flight Center at Cape Canaveral, Fla., are working to automate spacecraft launches. This may include such complicated maneuvers as mating the space shuttle with its rocket boosters.

The Information Sciences Division and Johnson Space Center in Houston will automate portions of the Shuttle ground mission control facility, with the goal of reducing human-intensive tasks by 40%. This will enable the same number of controllers who now work on space shuttle launches to control the space station, which will maintain a permanent presence in space. These controllers will be more productive, freed from routine tasks.

With engineers from Marshall Space Flight Center in Huntsville, Ala., Ames researchers are designing an automated science research module for the shuttle and space station. This facility will be flexible enough to be used in such diverse fields as astronomy, space biology and materials processing. It will be able to direct instruments to take data, saving time for the flight crew and increasing the science payload. It will also allow ground-based researchers to conduct experiments.

The AI space technology will be tested in a series of demonstrations, progressively increasing in complexity, to provide feedback for further development. For the first demonstration, scheduled for 1988 at the Johnson Space Center, the thermal control system for the space station will be automated. It will be tested in a real-time, operational environment and its peformance will be evaluated against decisions reached by the conventional system.

In 1990, the thermal and power subsystems of the space station will be automated and the two systems will "talk" with each other for common problem-solving. The system will be capable of understanding uncertainties in the data or unanticipated failures. It will be able to give an in-depth explanation of its decision process to the user so that its decisions can be evaluated.

In 1993 and 1996, an executive controller, capable of integrating information from multiple subsystems and sensors, and

- more -

involving both spaceborne and ground-based systems will be tested. Automated operations will include such complicated systems as the communications subsystem (which includes all radar and antennae) and thermal control system. The on-board system will be capable of interacting with either novice or expert users and will be able to teach users how to operate it.

The Information Sciences Division has put together a cooperative research team from universities, including Stanford University, M.I.T., U.C. Berkeley, University of Michigan and Carnegie-Mellon University, and from the artificial intelligence industry. However, the office will first focus on building up an in-house research capability. "We're very much in a growth mode," said Division Deputy Director John Bull. "We're expanding rapidly."

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Peter W. Waller 415/694-5091
Linda Blum

For Release:

Embargoed until
10:00 a.m. PDT
July 28, 1987

Release No. 87-36

FEDERAL SCIENCE AGENCIES TO INVESTIGATE
OZONE HOLE

NASA, The Department of Commerce National Oceanic and Atmospheric Administration, the National Science Foundation and its National Center for Atmospheric Research, and the Chemical Manufacturer's Association announced today a cooperative investigation of the Antarctic ozone hole. The interagency cooperative scientific program also involves scientists from Harvard University, the University of Denver and the University of Washington, and the governments of Argentina, Chile, France, New Zealand and the United Kingdom. Panama, Peru and Ecuador are also cooperating by allowing aircraft overflights of their countries.

The Airborne Antarctic Ozone Experiment will fly specially instrumented NASA ER-2 and DC-8 aircraft into the Antarctic ozone hole from August 17 through September 29. The timing of the flights coincides with the onset of the ozone hole in the atmosphere over the Antarctic and with the advent of temperature and sunlight conditions required for the aircraft flights. The Antarctic ozone hole begins at the end of winter in the Southern Hemisphere and lasts through spring.

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The mission is organized and managed by NASA with substantial contributions from the National Oceanic and Atmospheric Administration (Department of Commerce) and with the cooperation and involvement of the National Science Foundation (National Center for Atmospheric Research and Polar Programs Division), the Chemical Manufacturer's Association, various U.S. universities and and selected European meteorological organizations. Scientists and engineers from NASA, NOAA, NCAR and the universities will be stationed at Punta Arenas, Chile, for the duration of the aircraft flights.

Meteorological data from NASA's Nimbus 7 satellite and from various NOAA and European weather satellites and from ground stations at U.S. Antarctic stations will be coordinated with aircraft flights and aircraft data through a sophisticated real-time data network provided by NASA. The British Meteorological Office will use complex computer modeling to look at data from a given region of air and predict how that region will evolve over a period of days. ER-2 and DC-8 flight sampling of the air mass on subsequent days will test the validity of the computer model.

The aircraft will have largely independent but complementary scientific instruments. The ER-2 is scheduled to fly up to 10 separate missions from Punta Arenas, on the extreme southern tip of South America at the Straits of Magellan, over the Antarctic to about 72 degrees South Latitude and then return. This flight plan allows substantial penetration of the ozone hole. The DC-8 has a vastly longer range and will fly further south into the ozone hole as well as investigate the region around the hole.

Several of the ER-2 and DC-8 flights will be tandem to allow for the complementary sets of data to be acquired at the same time. At least two of the ten planned DC-8 flights will take it over the South Polar region continuing to New Zealand where it will lay over a day prior to returning on the reverse flight path to Punta Arenas.

- more -

Following each flight, the data from that flight's experiments will be used along with satellite and ground station data to plan the next flights. This will enable the scientists to optimize their flights for existing atmospheric conditions.

The ER-2 is a highly modified U-2 high-altitude earth resources and atmospheric research airplane. U-2 and ER-2 aircraft have performed various comparable missions worldwide over Arctic polar areas and remote ocean regions. It will fly in the region of maximum ozone depletion up to 65,000 feet and carry instruments designed to provide information on three-dimensional winds, pressure, temperatures and temperature profiles. Other ER-2 instruments will directly sample the chemical composition including the chlorine oxide radical, the bromine oxide radical, ozone, nitrous and nitric oxide, the total amount of water, methane and several chloroflurocarbons and samples of condensation nuclei (particulates which would cause condensation to occur) and cloud particles.

The DC-8 is a highly modified version of the commercial DC-8. It has been retrofitted with high-bypass-ratio turbo fan engines and its interior cabin space has been modified into a flying laboratory for earth resources and atmospheric remote sensing research. It will fly in the lower portion of the ozone depletion region at altitudes up to 40,000 feet and carry instruments to measure ozone and aerosol profiles, chlorine dioxide, bromine oxide radical, nitric acid, chlorine nitrate, nitrogen oxides as well as hydrochloric acid using both whole air sampling and remote sensing techniques.

The experiments have been designed not only to test existing Antarctic ozone hole theories but to provide for a wide base of high quality atmospheric data in the event that none of the current hypotheses proves to be adequate. Although the data from the various experiments will undergo preliminary analysis in Punta Arenas, the rigorous analysis and modeling of the data will not be done until the completion of the aircraft experiment. Once back home, the various scientific teams will work towards providing a rigorous and fairly complete analysis of their data by February 1988. At that time it is expected that the different science teams will meet to compare analyses and interpretations. A preliminary interpretation of the findings is expected to be available to the scientific community around May of next year.

This experiment is prompted by recent observations that have shown a dramatic and unexpected downward trend in the amount of ozone in a column of air over the Antarctic in the period between late winter and early spring. A column of air is the air which would be encountered along a straight line from the ground and continuing up through the atmosphere.

Beginning in 1979, the amount of reduction which has been observed up to 1986 has been about 40 percent of the previous historical late winter-early spring monthly mean. This observation has been reported by scientists from the British Antarctic Survey and confirmed by satellite observations taken with the Total Ozone Mapping Spectrometer aboard the Nimbus 7 spacecraft and further confirmed by a joint NSF/NASA/NOAA/CMA scientific investigation.

The 1986 National Ozone Expedition (NOZE-1), was conducted from late August, 1986, through early November, 1986, and involved ground based and balloon borne atmospheric measurements, carried out at McMurdo Station by teams from the NOAA Aeronomy Laboratory, the State University of New York at Stony Brook, the University of Wyoming and the NASA Jet Propulsion Laboratory.

Attempts by a large number of scientific organizations to correlate the ozone depletion with other atmospheric observations has produced a mixed set of results. Three prevailing theories held that the ozone hole phenomenon was caused by 1) human-caused chemical changes in the atmosphere; 2) naturally induced solar-caused chemical changes in the atmosphere; or 3) a change in dynamic circulation patterns in the area of the Antarctic.

The evidence obtained in the NOZE-1 campaign indicates that the ozone hole is not caused by changes in solar activity (item 2 above). Highly disturbed chemistry consistent with, but not definitive proof of the human-caused chemical change theory was found. The major theories to be tested by this year's aircraft and NOZE experiments are chemical and dynamics.

The airborne observation program will be complemented by a second NOZE campaign to be conducted from McMurdo Station, Antarctica, from August through November. This second campaign will also involve scientific teams from NOAA Aeronomy Laboratory, NASA, SUNY, University of Denver, SRI International and the University of Wyoming.

The data provided by the ER-2 and DC-8 aircraft flights, supported by the satellite and Antarctic ground station data, will provide a basic set of Antarctic ozone hole data which can then be used to address the probable causes of the ozone depletion phenomenon. In addition to collecting data pertinent to the current ozone hole theories, the instruments aboard the ER-2 and DC-8 are designed to acquire general atmospheric chemical and dynamical data. This additional data would be used to assist in postulating new theories for ozone hole depletion if the current theories prove to be invalid.

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Linda Blum, Peter Waller
415/694-5091
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For Release:
Immediate

NOTE TO EDITORS

Scientists from NASA, NOAA (National Oceanic and Atmospheric Administration), and other agencies and universities will leave for Chile on August 12, to conduct an airborne study of the hole in the ozone layer over Antarctica. Two NASA-Ames aircraft, a modified DC-8 and an ER-2 high altitude aircraft, will make up to ten research flights each through the ozone hole. Scientists hope to learn whether the ozone hole is caused by atmospheric dynamics or manmade chemicals. The ozone layer in the stratosphere protects the Earth from harmful ultraviolet radiation.

A briefing to discuss the mission, to be followed by a tour of the two aircraft, will be held on Tuesday, July 28, 1987, 10:00 a.m., at NASA's Ames Research Center, Mountain View, Calif. Speakers will be: Program Scientist Robert Watson of NASA Headquarters; Project Manager Estelle Condon of NASA-Ames; and Mission Scientist Adrian Tuck of NOAA.

A TV clip with flight footage of the ER-2 and DC-8 as well as photographs and print material will be available to the media.

The briefing will be carried over NASA Select Television which is transmitted on RCA Satcom F2R, transponder 13, freqency 3960 MHz (72° west longitude over the equator).

After the briefing, a panel of scientists will be available to answer questions for Washington media at NASA Headquarters, Washington, DC.

Media attending the Ames briefing should come to the NASA Building 245 auditorium.

July 20, 1987

NASA News

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For Release:
August 26, 1987

C. J. Fenrick

Release No. 87-39

NOTE TO EDITORS:

Eleven male volunteers between the ages of 30 to 50 years will have completed a 30-day bedrest study at NASA's Ames Research Center on Sunday, August 30. Data from this simulated weightlessness study will help NASA understand the mechanisms responsible for the physiological changes observed in long duration space missions.

These tests are part of a continuing series of bedrest experiments at Ames that have studied men and women of different age groups to test their reaction to simulated weightlessness, and physiological and pharmacological responses.

Several participants in the current test and Ames project officials will be available to news reporters at 10:00 a.m., Monday, August 31, in the Auditorium of N-239, Life Sciences Research Building. Reporters can tour the bedrest facility and discuss the tests with participants. Video and still photos of the test and facility will be available. Those planning to attend should come to the NASA gate of Moffett Field.

-end-

August 25, 1987

NASA News

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AC 415 694-5091

For Release:

C. J. Fenrick
New Release No. 87-40

August 31, 1987

Information Summaries

NASA Ames Research Center has been conducting bedrest studies since 1971. Data from these simulated weightlessness studies will help NASA understand the mechanisms responsible for the changes observed in long duration space missions and to determine how weightlessness affects the body and its ability to react to reentry stresses. This is particularly important in the development of protective procedures and countermeasures.

Of the eleven men subjects who participated in the current study that ended on Sunday, August 30, the following information is available on seven California residents: Tim Doyle of Fremont, Lance T. Hinkley of Hillsborough, Samuel Kampschmidt of South San Francisco, Russell Nelson of San Jose, Bob Norby of Oakland, Patrick A. Taylor of Montara, and Craig D. Ross of Union City.

The following ARC investigators and support persons conducted the current bedrest study:

Joan Vernikos-Danellis, Ph.D., acting Associate Director,
Directorate of Space Research
NASA, Ames Research Center

Paul Buchanan, M.D., Director
Biomedical Operation and Research Office
NASA, Kennedy Space Center

Lanny C. Keil, Ph.D.,
Research Scientist,
NASA, Ames Research Center

Victor A. Convertino, Ph.D.,
Research Scientist,
NASA, Kennedy Space Center

Mark Du Voison, B.S.,
Biomedical Engineer
NASA, Kennedy Space Center

Dee O'Hara, B.S.,
Manager, Human Research Facility
NASA, Ames Research Center

Numerous other un-named university co-investigators came to Ames and assisted in the 30-day bedrest study. Ranita A. Dalton, supervisor, and Gail Bennett-Hiley, project manager, work for the Bionetics Corp., support services contractor to the Human Research Facility. Located adjacent to the facility, in the Life Sciences Building, the Bionetics Corp. recruits and provides initial interviewing and screening of men and women volunteers.

Future Plans:

Coordinate the assemble of data on the more than 15 bedrest studies performed at Ames.

Publish this history (assembled data) when it is finished.

Assist in the complete documentation (with still shots and videos) of all the experiments in next's year bedrest study.

-end-

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C. J. Fenrick

For Release:
September 15, 1987

Release No. 87-42

FORMER AIDE TO SEN. BARRY GOLDWATER
NAMED TO NASA-AMES POST

NASA Ames Research Center's Director William F. Ballhaus recently announced the appointment of John F. Murphy, as chief, to the newly created External Affairs Office. Before taking his post at Ames, Murphy served as the Assistant Administrator for Legislative Affairs, NASA Headquarters, Washington D.C., since September 1981 where he was the principal advisor to the Administrator and other NASA officials on all matters pertaining to Congress.

Murphy will be responsible for developing and expanding a wide variety of Center and NASA activities designed to enhance working relationships, program coordination, and dissemination of information concerning NASA and Ames activities throughout the thirteen Western States. In accomplishing this new role, he will work closely with industry, the academic community, state and local government, and the general public.

Born in Orlando, Florida, Murphy with his family moved to Arizona several years later. Murphy served in the U.S. Navy from 1944 to 1946. Following that, he attended Phoenix College and the University of Arizona. In 1956, he was Vice President of News/Public Affairs, for Radio-TV KOOL in Phoenix, Arizona. From

-more-

1969 to 1972, he was the Senior Television Advisor to the Government of the Republic of Vietnam and the Joint U.S. Public Affairs Office, Saigon, SVN. After his assignment in Southeast Asia, he served as deputy director of Communications at the Department of the Interior from 1972 to 1974. From 1974 until March 1981, Murphy was Senator Barry Goldwater's Administrative Assistant. And from March to September 1981, he was the Director for Legislative Affairs, for the Agency for International Development, Washington, D.C.

Murphy's technical papers include information on TV production techniques, newsroom management and broadcast newsgathering standards. He belongs to a number of professional societies including Sigma Delta Chi, Broadcast Pioneers, the National Academy of TV Arts and Sciences, and the National Press Club.

Murphy is married to the former Mary Elizabeth Rutschman Campbell. He has two daughters, Kathleen M. Harber and Patricia M. Alderman. As most newly arrivals to Ames, the Murphys are searching for a home in the San Francisco Bay Area.

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-end- September 15, 1987

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C. J. Fenrick

For Release:

Release No. 87-43

IMMEDIATE

NASA'S HIGH ALTITUDE AIRCRAFT
MONITOR CALIFORNIA FOREST FIRES

During the recent seige of lightning-caused forest fires in California, NASA-Ames research aircraft participated in the detection, and mapping of the major fire areas.

According to fire research scientists, California's forests sustained the greatest fire damage in history, this year.

The high altitude reconnaissance flights identified and located six previously unknown fires.

The flights allowed both California and the United States Forest Services to see where the hottest fires were located, make assessment of the severity of the fires, and to redistribute their resources to the more critical areas of the state.

The value and advantage of high altitude aircraft for forest fire reconnaissance was clearly demonstrated during September 1987. Unfortunately because of the current deployment of NASA's ER-2 and DC-8 to Chile in support of the Antarctic Ozone Hole Investigation, flight crews were unavailable to support the fire suppression activities in California, until September 9.

NASA's U-2 and Lear Jet aircraft were involved from September 9 to 14 in acquiring data from a six-band Thermal Infrared Multispectral Scanner (TIMS). Flying over California,

-more-

September 25, 1987

the U-2 flew at 65,000 feet and Lear Jet flew at 40,000 feet. Prior to sunrise, five TIMS and one U-2 Thematic Mapper Simulator flights were flown. Prior to sunrise is the best time of day to achieve a high thermal object/background ratio.

Upon completion of daily data acquisition the NASA Lear Jet (from NASA's National Space Technology Laboratories, Mississippi) delivered high density digital flight tape to Ames for conversions to computer compatible form and subsequent processing and interpretation. In analyzing of the data, mapping active fire fronts, and identifying spot fires, Ames data management facility personnel cooperated and consulted with California Department of Forestry staff representative Bob Weaver (Sacramento office) and US Forest Service Thermal Infrared Interpreter Carl Skinner (Shasta-Trinity National Forest).

From 11:20 a.m. on August 30, 1987 through 10:40 p.m. September 2, (81 hours) California had 8,860 lightning strikes detected. As a result of low rainfall this past winter creating extremely dry conditions, plus the dry air mass associated with the lightning activity, over 1,200 fires were ignited by lightning strikes. Smoke generated by the fires, intensified by a strong inversion, resulted in extremely heavy smoke over northern California. Ordinary means of ground reconnaissance methods for localization and mapping of fires were ineffective.

The following are the four major areas monitored by the NASA aircraft: Stanislaus National Forest, portions of Plumas National Forest, Mendocino National Forest, and Klamath/Shasta-Trinity

-more-

National Forests. One example of the area involved in or threatened by forest fire was approximately 2Ø by 1ØØ miles within the Klamath/Shasta Trinity National Forests.

-end- September 25, 1987

Note: Upon request, black and white prints from the U-2 overflights of selected forest areas will be available to the media.

NASA News

National Aeronautics and
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For Release:

C. J. Fenrick

September 29, 1987

Release No. 87-44

NEW DIRECTOR OF EXTERNAL AFFAIRS
NAMED AT NASA-AMES

NASA Ames Research Center's Director William F. Ballhaus, Jr., recently announced the appointment of John F. (Jack) Murphy, as chief of the newly formed External Affairs Office effective August 31. Before taking his post at Ames, Murphy served for six years at NASA Headquarters as the Assistant Administrator for Legislative Affairs, in Washington D.C., where he was the principal advisor to the administrator and other NASA officials on all matters pertaining to Congress. At Ames, Murphy will be responsible for developing and expanding a wide variety of Center and NASA activities designed to enhance working relationships, program coordination, dissemination of information concerning NASA and Ames activities throughout the 13 Western states, nationally and internationally. In his new role, he will work closely with industry, the academic community, state and local government, news media, and the general public.

Born in Orlando, Florida, Murphy moved with his family to Arizona when less than two years old. Murphy served in the U.S. Navy from 1944 to 1946. Following that, he attended Phoenix College and the University of Arizona. Murphy started his broadcast career in radio in 1942. In 1949, he presented the

-more-

first newscast on the first television station in Arizona, KPHO-TV. In 1956, he joined KOOL-Radio-TV in Phoenix and was named Vice President of News/Public Affairs. From 1969 to 1972, he was the Senior Television Advisor to the Government of the Republic of Vietnam and to the Joint U.S. Public Affairs Office, Saigon, SVN. After his assignment in Southeast Asia, he served as deputy director of Communications at the Department of the Interior in Washington, D.C., from 1972 to 1974. From 1974 to March 1981, Murphy was Administrative Assistant to Senator Barry Goldwater (R-AZ). And from March to September 1981, he was the Director for Legislative Affairs, for the Agency for International Development.

Murphy's technical papers include information on TV production techniques, newsroom management and broadcast newsgathering standards. He belongs to a number of professional societies including Sigma Delta Chi, Broadcast Pioneers, the National Academy of TV Arts and Sciences, and the National Press Club.

Murphy is married to the former Mary Elizabeth Rutschman Campbell. Murphy has two daughters, Kathleen M. Harber, Atlanta, GA, and Patricia M. Alderman, San Jose, CA.

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Note:
A photograph of Mr. Murphy is available to the media by contacting C. J. Fenrick, 415-694-5091.

-end-

September 29, 1987

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For Release:

Peter W. Waller 415/694-5091

Immediate

Release No. 87-46

NOTE TO EDITORS:

The NASA-Ames ER-2 high altitude aircraft and DC-8 flying laboratory aircraft will return to Ames Research Center, Mountain View, Calif., between 3:00 and 5:00 p.m. Saturday, October 3, after 25 flights through the Antarctic ozone hole. Flight crews, scientists, and project officials will be available to news reporters and photographers at that time, as will the returning aircraft.

The Ames DC-8 made 13 flights through the ozone hole; the ER-2 made 12 flights. On five of the flights, observations were coordinated between the two craft. Flights were based at Punta Arenas, Chile, and the DC-8 flew from there over the Antarctic to New Zealand. One hundred fifty individuals from 19 organizations and four countries were involved. The expedition is considered a success.

The ER-2 carried 14 experiments and the DC-8 had seven with their experimenters. The DC-8 flew 75,000 miles at about 42,000 feet on its missions, the ER-2, 36,000 miles with its highest altitude 68,000 feet.

News reporters planning to attend should come to the main gate of Moffett Field and will be directed from there.

September 29, 1987

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Diane F. Stanley 415/694-5091

For Release:

Immediate

Release No. 87-48

SOVIET BIOSATELLITE MISSION UNDERWAY WITH U.S. PARTICIPATION

On September 29, the Soviet Union successfully launched Cosmos 1887, a biosatellite mission. More than 50 NASA-sponsored scientists from Ames Research Center, Moffett Field, Calif., and universities throughout the nation are involved directly in 27 major joint experiments aboard Cosmos 1887.

The cooperative effort is taking place as one of the 16 agreed projects under the US/USSR Space Agreement signed in Moscow in April. Ames Research Center has lead responsibility for implementing U.S. participation in Cosmos 1887.

These experiments are investigating the effects of space flight on the major body systems, including skeletal bones and muscles, the nervous system, heart, liver, several glands and blood. Special tissue culture studies using pituitary cells will study growth hormone. Spleen and bone marrow cells will be used to investigate the effects of microgravity on the immune system.

The experiments are being performed in collaboration with Soviet research scientist teams managed by the Institute for Biomedical Problems in Moscow. The Soviets will provide tissue samples from five of 10 rats that will have flown up to 14 days aboard the spacecraft. The majority of the scientific specimens will be returned to the U.S. in late October and distributed to the scientific teams around the country. The remainder of the biosamples will arrive in early November for analysis.

- more -

The United States has collaborated with the Soviet Union for more than 16 years in space biology and medicine, with the U.S. participating in five previous Cosmos missions. The last collaborative mission was in 1985 and involved a single American experiment.

In addition to the biomedical experiments, the U.S. has placed eight radiation detector packages inside and outside the Biosatellite spacecraft to measure radiation. These measurements will determine the dosages in space that could be harmful to astronauts in orbit.

A preliminary report on the results of these studies will be released 60 days after recovery of the spacecraft. A final report will be released in 6 months.

A team of eight American scientists and engineers are travelling to the Soviet Union in early October for the return of the Cosmos spacecraft. The team is headed by James Connolly, Cosmos project manager, and Dr.'s Rodney Ballard and Richard Grindeland, project scientists at Ames Research Center.

October 2, 1987

NASA News

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C. J. Fenrick

For Release:
October 27, 1987

Release No. 87-51

NOTE TO EDITORS: Reports on Wildfires and Their Effects

Copies of scientific papers authored by two Ames' fire scientists who are involved in the California Controlled Fire Studies have been duplicated. A limited number of these reports is available at this Office for the media. These reports are excellent source materials for understanding the nature of burning biomass and remote sensing by aircraft.

James A. Brass and Vincent G. Ambrosia, research scientists, Ecosystem Science and Technology Branch of the Life Science Division, published the following papers:

*<u>Thermal Analysis of Wildfires and Effects on Global Ecosystem Cycling and Aircraft</u>

*<u>Satellite Thermographic Systems for Wildfire Mapping and Assessment"</u>

*#<u>Global Natural Vegetation Removal and Effects on CO2 Concentrations and Cycling Monitored with Remotely Sensed Information</u> #Authored by Vincent G. Ambrosia

-end-

*These papers have been declared works of the U.S. Government and therefore are in the public domain.

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C. J. Fenrick

For Release:
October 27, 1987

Release No. 87-52

NOTE TO EDITORS: Reports on Exercise and Deconditioning

Copies of progress reports edited by an Ames' research physiologist who is involved in the Bedrest Studies have been duplicated. A limited number of these reports is available at this Office for the media. These reports are excellent resources reviewing the variety of exercise training programs comtemplated for all astronauts to undertake on the ground and in the Space Staion to maintain their physical working capacity and endurance for effective extravehicular activity and normal vehicular activity.

John E. Greenleaf, Ph.D., research scientist, Space Physiology Branch of the Life Science Division, published the following papers:

*<u>Progress Report: (1986) Volume 1, 2</u>
<u>Exercise Countermeasures for Bed Rest Deconditioning</u>

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Peter W. Waller Linda Blum 415/694-5091

For Release:

Immediate

Release No. 87-53

AIRBORNE OBSERVATORY LEAVES FOR
NEW ZEALAND TO STUDY SUPERNOVA CORE

NASA's C-141 Gerard P. Kuiper Airborne Observatory (KAO) will leave October 31 for Christchurch, New Zealand, in a month-long mission to study the brilliant supernova, SN-1987a, officials at NASA's Ames Research Center, Mountain View, Calif., said today. SN-1987a, located 170,000 light years away, is the closest supernova to Earth since the invention of the telescope nearly four hundred years ago.

Four teams of scientists aboard the Kuiper will make a total of eight research flights to study the supernova, with the first flight scheduled for November 4 and the final flight for November 24.

Using four advanced infrared instruments, experimenters will look for evidence of synthesis of metals such as iron, nickel and cobalt and other heavy elements within the supernova's core. All of the heavy elements in the universe -- including the iron and calcium in our bodies -- are believed to be forged within and scattered through space by supernova. However, this process has never before been directly observed.

The Kuiper, the world's largest airborne observatory, will observe the supernova in key infrared spectral ranges which

- more -

cannot be studied from the ground. A modified Lockheed C-141 jet transport aircraft fitted with a 36-inch diameter telescope, the Kuiper flies at 41-45,000 feet, above 99 percent of the atmosphere's water vapor, which attenuates infrared signals.

The scientists will study the kind and amount of condensed materials present. This will help in determining how much of the heavier gases in the universe is locked up in dust. The researchers also expect to learn what state material is in when ejected from the supernova. Metal gases are thought to condense to form dust particles as they leave the supernova, but this hypothesis has never been confirmed. It may be that material escapes in the form of gas and condenses elsewhere.

In addition, the researchers may be able to determine what compounds iron and other elements form when dispersed in interstellar space, a fundamental astrophysical question.

The upcoming mission marks the second time the Kuiper has studied the supernova. An earlier mission took place in New Zealand in April. At that time, Kuiper researchers observed the supernova's "dust echo," condensed material belonging to the star before it exploded into a supernova. They also studied properties of the supernova star's expanding photosphere, the original surface of the star, which had not then expanded enough to permit observation of the supernova's core.

By comparing the earlier observations with the new findings, the Kuiper researchers believe they will be able to separate the spectral signature of the "dust echo" from that of the particles formed by the supernova. This has never been done before and is a major step forward in understanding supernova processes.

The Kuiper will return to New Zealand to study the supernova twice in 1988 and at least once in 1989. The November mission will be conducted in cooperation with two other NASA-sponsored experiments. Four balloons, to be launched from Alice Springs, Australia between October 26 and December 14, will make gamma-ray observations, searching for signals from the radioactive decay of heavy elements in the supernova. In addition, two sounding rockets will be launched from Australia's Woomera range on November 12 and November 18, making X-ray and ultraviolet observations.

Based at and operated by NASA-Ames, the Kuiper is a national facility accessible to researchers from government, universities, and private research institutions. The observatory is regularly used for studies of star formation and evolution and for planetary science.

# # #

INSTRUMENTS TO BE USED:

1. Cooled Grating Spectrometer -- Principal Investigator Dr. Ed Erickson, NASA's Ames Research Center

Spectral Range 20-90 microns; used to study individual spectral lines from heavy elements in core. Resolution is good enough to study velocities or elements in the core. Any asymmetries in the velocity profiles will give information about structure in the core.

2. Faint Object Grating Spectrometer -- Principal Investigator Dr. Fred Witteborn, NASA's Ames Research Center

Spectral Range 4-12 microns (low resolution); used to study dust echo and dust condensing in supernova shell. Resolution is good enough to detect molecular features in the dust to allow identification of type of dust.

- more -

3. Mid-Infrared Spectrophotometer -- Principal Investigator Dr. Harvey Moseley, NASA's Goddard Space Flight Center

Spectral range 20-70 microns (low resolution); used to study properties of dust echo and condensing dust and to search for evidence of unexpected spectral lines from the core. (That is, lines that were not expected to be bright based on current models.)

4. Multi-Wavelength Photometer -- Principal Investigator Dr. Paul Harvey, University of Texas

Spectral range 40-200 microns (very low (spectral) resolution); used to map the emission from cooler dust around and in the supernova.

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Peter W. Waller 415/694-5091

For Release:

Immediate

Release No. 87-54

NOTE TO EDITORS

A NASA scientist has made the first accurate measurement of the total amount of carbon flowing from Earth's deep interior. Some 35 billion tons of carbon dioxide gas comes from the molten rock of Earth's mantle each year. This carbon has had a basic role in shaping our planet throughout its 4.5 billion year history and this new measurement allows greater understanding of the development of life processes, climate, oceans, and surface character of the Earth.

Dr. David Des Marais of NASA's Ames Research Center, Mountain View, Calif., made the discovery.

A briefing outlining Des Marais' research and its consequences will be held at NASA's Ames Research Center on Tuesday, November 24, at 10 a.m.

Diagrams, photographs and a videotape illustrating the work will be available for news reporters. Those planning to attend should come to the NASA gate of Moffett Field and will be directed from there.

November 10, 1987

NASA News

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Ames Research Center
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Peter W. Waller 415/694-5091
Linda Blum

For Release:

10:00 a.m. PST, Tuesday
November 24, 1987

Release No. 87-55

EARTH'S OUTFLOW OF CARBON DIOXIDE
MEASURED ACCURATELY FOR THE FIRST TIME

A NASA scientist has made the first accurate measurement of the amount of carbon dioxide flowing from Earth's interior.

The finding by geochemist David Des Marais of NASA's Ames Research Center in Mountain View, Calif., provides insights into climate, plate tectonics, and the evolution of living organisms on the planet. The research supports theories that early Earth had a hot climate when life began.

Approximately 30-35 million tons of carbon dioxide per year is coming up from volcanic vents in the ocean, according to Des Marais. This is more than 90 percent of the global carbon outflow from the Earth's mantle. (The rest comes up on the continents.)

Des Marais' finding -- the result of a new method he developed for purifying and analyzing carbon -- is by far the most accurate to date. Previous calculations have ranged from one tenth to ten times his result.

Over Earth's history, outgassing from the interior has built up most of the carbon at Earth's surface. The partitioning of carbon at the surface -- between the ocean, atmosphere and

- more -

the amount of carbonate rocks in the Earth's crust. The amount of carbon outflow now calculated is enough to indicate that outflow from Earth's deep interior has also been a significant factor in controlling the amount of carbon in Earth's atmosphere and oceans.

The NASA research will allow more accurate calculations of carbon dioxide outflow during many earlier eras in Earth's 4.5 billion-year history. This, in turn, will help scientists better define Earth's temperature and climate during these periods. The amount of carbon in Earth's atmosphere is a major determinant of climate, since carbon dioxide is a strong greenhouse gas, which traps heat in the atmosphere, warming the climate.

Outflow has affected the amount of carbon at Earth's surface over billions of years. It is not a significant factor in controlling atmospheric carbon dioxide today -- and does not affect the "greenhouse warming" which may be caused by burning of fossil fuels.

The research supports theories that ancient Earth had a hot climate. Scientists have long known thatEarth's interior was hotter than at present during the several hundred million years when life first appeared. This drove more intense volcanism and, thus, a greater outflow of gases. The amount of carbon dioxide production on Earth today is high enough to suggest an extremely high rate of carbon outflow on early Earth, Des Marais says. In its first billion years, Earth may have had more than 1,000 times as much atmospheric carbon dioxide as at present, according to Des Marais.

A hotter climate on ancient Earth would have greatly affected the chemical evolution of ever-more complex organic molecules and their subsequent replication to produce the first living organisms. It would also have shaped the early evolution of living organisms themselves, since most life processes are temperature-dependent.

A high level of carbon in the warmer oceans may have made it easier for primitive life forms to evolve, by enabling organisms to expend less energy on converting carbon dioxide to make organic matter. (Carbon dioxide is basic to all life processes. Animals produce carbon dioxide in generating energy, while plants require carbon dioxide for growth.) Abundant carbon dioxide in the atmosphere and oceans could have promoted plant growth.

As carbon dioxide levels declined over the Earth's history, plants would have had to adapt to progressively lower levels of this essential gas. "The initial high level of carbon dioxide, and its subsequent decline, may well have been a major factor in the evolution of life," Des Marais says.

The early high atmospheric carbon dioxide levels would have declined after the first billion years. Atmospheric CO_2 levels are thought to have dropped as the continents accreted, and carbonate rocks were formed, tying up some of the carbon from the atmosphere and oceans. But, Des Marais says the total amount of carbon at the Earth's surface -- in the atmosphere, ocean and continents -- may also have declined. According to Des Marais, some of the carbon outgassed from the interior mantle to the surface may have been subducted back down into the interior -- driven back down aboard descending plates of the Earth's crust during plate collisions.

The NASA research shows that carbon is coming up at a rate high enough to have built up the amount of carbon at Earth's surface in just two billion years. Since Earth has existed for 4.5 billion years, this suggests that carbon has come up twice as fast as necessary to account for the amount of carbon present today. Up to half the carbon dioxide outgassed over Earth's history may have been recycled back down to the Earth's interior, Des Marais believes.

As Earth's interior cooled, the rate of outflow would have slowed. At the same time, the subduction process would have become more efficient, since the cooler interior would have a greater capacity to hold carbon. Thus the amount of carbon at Earth's surface (in crust, ocean and atmosphere) could actually have dropped, Des Marais says. Previous investigators have assumed that the total amount of carbon at Earth's surface has steadily increased.

Des Marais has also found that the carbon now coming up from the interior has the same composition of isotopes as carbon in sedimentary rocks of the crust. This supports the theory that the same carbon is being driven back to the interior and then returned again to the surface. "It suggests that the crust and mantle have indeed been communicating," Des Marais says.

To determine the rate of carbon outgassing, Des Marais measured the amount of carbon in samples of basaltic rock from ocean ridges in the Caribbean Sea, in the Pacific coast off Mexico and off Washington state, and in the north Atlantic.

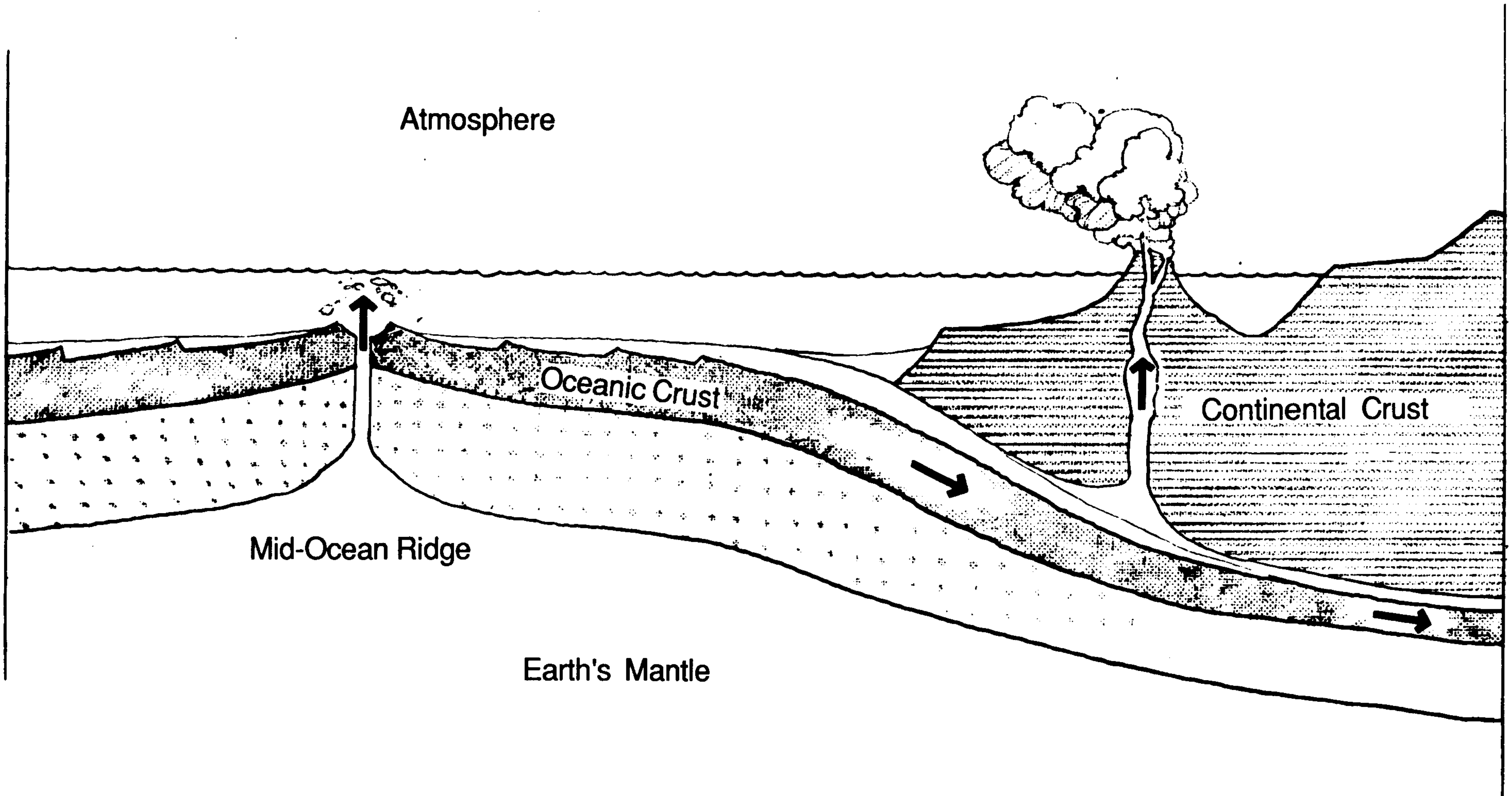
He then determined the total oceanic rate by establishing the ratio of carbon in his samples to the amount of helium 3, a rare isotope of helium. Since the amount of total oceanic helium 3 outgassing is known, he was able to calculate the equivalent figure for carbon.

Des Marais has developed a new method for cleaning carbon samples by burning them in pure oxygen at 450° C, before heating them to 1200° C, which melts the rock. The carbon, converted to CO_2, is then distilled from other gases and measured by volume and pressure. This method allows the carbon to be purified and analyzed without exposing it to the atmosphere and other sources of contamination.

Researchers have attempted to measure the rate of carbon outgassing for more than 40 years, but previous efforts, using chemical cleaning methods, were hampered by contamination by organic carbon, a major problem in carbon analysis.

November 12, 1987

Earth's Outgassing of Carbon



NASA News

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For Release:
November 17, 1987

Les Reinertson
Headquarters, Washington, D.C.
(Phone: 202/453-2754)

C. J. Fenrick
Ames Research Center, Moffett Field, Calif.
(Phone: 415/694-5091)

Release No. 87-56

ARVIN/CALSPAN CORP. SELECTED BY NASA FOR CONTRACT NEGOTIATION

NASA's Ames Research Center, Mountain View, Calif., has selected Arvin/Calspan Corporation, Buffalo, N.Y., for final negotiations leading to award of a 5-year, cost-plus-award-fee contract with a proposed value of approximately $43.2 million.

Arvin/Calspan Corp. will provide services for the operations, maintenance, repair and engineering support of aerodynamic test, calibration and support facilities required to support the center's 22 facilities (wind tunnels, ballistic ranges and shock tubes).

The contract will contain a 2-year base period plus a 1-year, priced option and a 2-year, priced option.

- end -

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1987

Peter W. Waller 415/694-5091

For Release:
Immediate

Release No. 87-57

PIONEER VENUS ORBITER WILL OBSERVE NEW-FOUND COMET

From November 19-24, the Pioneer Venus Orbiter Spacecraft (Pioneer 12) will observe Comet McNaught (Comet 1987-B1) using its ultra violet spectrometer instrument. Comet McNaught appears to be a new comet on its first trip past the sun. The cometary hydrogen coma will be observed each day. On November 22, the comet will be centered in the spectrometer field of view; oxygen and carbon will also be measured.

The normal Pioneer 12 attitude provides almost ideal pointing for viewing the comet and only a single small attitude change maneuver will be needed on November 19.

Although the tracking, which is scheduled for Pioneer 12 during the observation days, is not continuous, the instrument observation schedule has been tailored to the tracking schedule.

The Pioneer 12 Spacecraft has been orbiting Venus since 1978, has made thousands of photographs of the planet's cloud tops, and has radar-mapped its surface for the first time.

The Pioneer Project is managed by NASA's Ames Research Center, Mountain View, CA.

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Peter W. Waller, Linda Blum 415/694-5091

For Release:

December 11, 1987
10:00 a.m. PST

Release No. 87-60

WORLD'S TWO LARGEST WIND TUNNELS GO OPERATIONAL

The world's two largest wind tunnels will become fully operational on Friday, December 11, 1987. The tunnels are housed in a single facility, the National Full-Scale Aerodynamics Complex (NFAC), at NASA's Ames Research Center, Mountain View, Calif. The new complex will be a major resource for aeronautical research and development for the United States.

While the complex is new, it has roots in a facility, the 40-by 80-Foot Wind Tunnel, which has long been known as the "world's largest closed circuit wind tunnel." The 40-by 80-Foot Wind Tunnel has made major contributions to the aeronautical preeminence of the United States for over forty years through the full-scale testing of many of the nations's most important aircraft. In additon to an upgraded 40-by-80, the NFAC adds the all-new 80-by 120-Foot "open circuit" Wind Tunnel, largest in the world.

The two tunnels provide unique facilities for full-scale and large-scale testing of advanced aircraft, closely simulating actual flight conditions. The facility provides valuable new capability for full-scale testing of rotorcraft and

- more -

vertical/short takeoff and landing (V/STOL) aircraft through a wide speed range. The facility will also be used for fundamental research in air flow phenomena and acoustics. The two tunnels are large enough to test full-scale aircraft with their engines running.

The two wind tunnels operate in the low speed range (up to 115 mph for the 80-by-120; up to 345 mph for the 40-by-80). This is the speed range that is essential for the investigation of the critical takeoff and landing phases of flight, not only for rotorcraft and low speed aircraft, but also for high speed vehicles like the Space Shuttle and the National Aero-Space Plane.

The test section of the new 80-by 120-Foot Wind Tunnel is 80 feet high and 120 feet wide -- three times larger in cross section than its companion 40-by 80-Foot Wind Tunnel. The 80-by-120 adds the capability to test aircraft models and actual aircraft as large as mid-size jet transports. The tunnel's large cross-sectional area will minimize tunnel wall boundary effects which can distort test results. These effects are most severe at the very low speeds covered by the tunnel.

The 80-by-120 will be particularly valuable for rotorcraft and V/STOL testing, since tunnel wall interference is a crucial problem in these research areas. (Air deflected downward by rotors and V/STOL engines can reflect off tunnel walls and ceiling and recirculate, invalidating some test results.) In addition, V/STOL testing requires very large tunnels since large-scale models are needed to duplicate the aerodynamic details of these aircraft.

The test section of the 80-by-120 is housed in a 600 foot-long structure with an air intake that is 360 feet wide and 130 feet high. It is an open circuit tunnel; air is drawn into the intake at one end of the leg and then passes through the test section. The air then passes into the return leg of the 40-by-80 after leaving the test section and through the six fans that the 80-by-120 shares with the 40-by-80. The 80-by-120 open circuit is completed by exhausting through new vents in the 40-by-80 circuit. During 80-by-120 operation, movable vanes close off the remainder of the 40-by-80 circuit.

The upgraded 40-by 80-Foot Wind Tunnel (40 feet high; 80 feet wide) complements the 80-by-120; though smaller, it can attain faster speeds. The 40-by-80's speed has been increased from 230 mph to 345 mph through an almost four-fold power increase for the motors driving the six fans. Total power is 130,000 horsepower. The enhanced speed will enable comprehensive testing of many types of advanced aircraft. In addition to the increase in speed, the tunnel has also had structural improvements and improvements in flow quality.

Both of the test sections have been acoustically treated to keep noise levels low in the surrounding community and to improve acoustic testing. The high-quality acoustics allow sensitive testing of actual aircraft noise levels -- particularly important for rotorcraft studies.

An important role of the wind tunnel complex will be to verify findings developed by computational fluid dynamics (CFD) studies. In particular, NFAC researchers will work cooperatively with researchers at the new Numerical Aerodynamic Simulator (NAS) supercomputer facility at NASA-Ames.

The wind tunnel complex itself relies heavily on computers, with computers handling data acquisition and display, data base management, systems monitoring, communication, and model control. Up to 1250 data channels flow into the computer at rates of two million bits per second. Test findings can be compared within seconds with theoretical predictions or other experimental data; displays are generated almost instantaneously.

The total cost of constructing the NFAC facility, including upgrading and renovating the 40-by-80, was $122.5 million. The facility covers twelve acres. The air circuit is over a half-mile long, and at maximum airspeed, the airflow is some 63 tons per second.

In addition to the increased speed, modifications to the 40-by-80 include: an upgraded data acquisition system with an increased number of data collection channels; an automated fan drive and model support controls to increase test productivity; a new electronic model force measurement system to provide more reliable measurements of overall aerodynamic forces; a new air exchanger that brings cool air into the tunnel circuit; allowing the tunnel to operate for longer periods of time; and new flow turning vanes to reduce required drive power and maintain good test section flow quality.

The two tunnels cannot be operated simultaneously since they share a common set of motors and drive fans. However, there is full access to the 80-by-120 test section during closed-circuit operation of the 40-by-80, allowing for model preparation and checkout prior to tunnel testing.

The NFAC is a national facility, available for use by government agencies, industry, private universities and other researchers from throughout the United States.

December 1, 1987

Diagram Caption

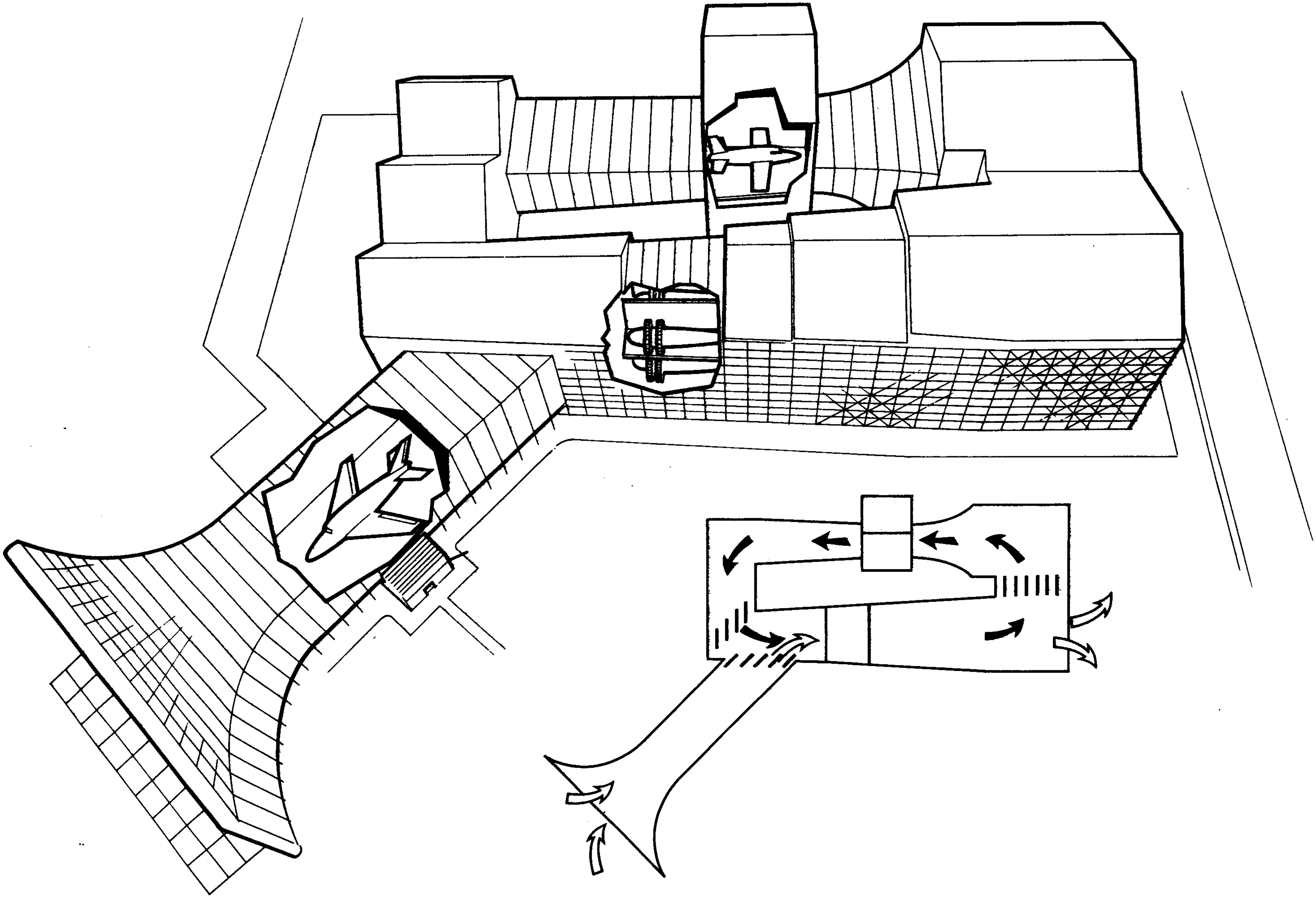
(SEE REVERSE)

Conceptual view of NASA-Ames' National Full-Scale Aerodynamics Complex (NFAC)

As shown in the small diagram, the facility is two tunnels, powered by one set of motors and drive fans. When the 40-by 80-foot test section is used, tunnel air goes round and round in a continuous loop. When the larger 80-by 120-foot test section is operating, air is pulled in through the big, horn-shaped inlet, flows down one side of the loop and back to the outside.

In the larger drawing, the three cutaways show the 40-by 80-foot test section (top), the 130,000 horsepower tunnel drive fans (center), and the 80-by 120-foot test section in the big horn. While one tunnel is running, models will be set up in the other tunnel, and vice versa. These tunnels are large enough to test full-scale aircraft with their engines running.

December 2, 1987



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Moffett Field, California 94035
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Peter W. Waller 415/694-5091

For Release:

Immediate

Release No. 87-61

NOTE TO EDITORS:

The world's two largest wind tunnels will become fully operational on Friday, December 11, 1987.

The new twin-tunnel facility, known as the National Full-Scale Aerodynamics Complex (NFAC), located at NASA's Ames Research Center, Mountain View, Calif., will be a major and essential resource for the United States.

The Complex will provide critical full-scale testing of U.S. advanced aircraft as large as medium transports -- and very large-scale tests of such high-speed vehicles as advanced Space Shuttles and the planned airfield-to-orbit Aero-Space Plane. It will provide essential data on the critical landing and takeoff profiles, basic for all flight vehicles. A major use will be for full-scale testing of vertical and short takeoff and landing craft which require large tunnels. Full-scale wind tunnel testing is the next best thing to actual flight.

News briefing, media tour, and dedication ceremonies to mark opening of the Complex will be held on December 11. (See attached schedule).

Scale of the NFAC is tremendous, and its huge components are highly dramatic. Air intake for the larger tunnel is 360 feet wide (longer than a football field) and 130 feet high. Test section for this tunnel has a cross section of 80 by 120 feet.

- more -

While new, the Complex is a restructuring of the famous "world's largest" 40-by 80-foot tunnel, which has done full-scale testing of a wide range of important aircraft for forty years. Drive power of the six huge fans for the Complex has been increased nearly four-fold to 130,000 horsepower. NFAC is a national facility, available to U.S. government, industry, and universities. The NFAC complex provides major advantages to U.S. aerospace organizations, in a crtical economic period when aerospace, along with agriculture, is the country's leading earner of foreign exchange.

NASA-Ames will have press facilities for news reporters wishing to cover NFAC's going operational on Thursday and Friday, December 10 and 11.

A facility tour and photo opportunities will be available at 10:00 a.m. Thursday (or other times by arrangement). On Friday, a tour for news media will take place at 8:00 a.m. with a news briefing at 9:00 a.m., dedication ceremonies from 10:00 to 10:45 a.m., aircraft flight demonstrations at 11:25 a.m., and tours of Ames at 1:00 p.m.

A large selection of still photos, video tape, and print material on the facility and event will be available.

Reporters planning to attend should come to the NASA Reception Center at Moffett Field, and will be directed from there. For arrangements and other information, call the Ames Public Information Office, 415/694-5091.

# # #

December 2, 1987

SUMMARY OF NEWS EVENTS

DEDICATION OF THE NATIONAL FULL-SCALE
AERODYNAMICS COMPLEX

Date		Place
Thursday, December 10, 1987		
10:00 a.m.	Media tour/photo opportunity (Other times can be arranged.)	NFAC
Friday, December 11, 1987		
8:00 a.m.	Media tour/camera setup	NFAC
9:00 a.m.	Media breifing	N-201, Main auditorium
10:00-10:45 a.m.	NFAC Dedication	NFAC
11:25 a.m.	Flight demonstration V/STOL Research Aircraft (VSRA-Harrier Quiet Short/Haul Research Aircraft (QSRA) Tilt Rotor (XV-15) (static)	Flight line
12:15 p.m.	Lunch	N-235 Cafeteria
1:00 p.m.	Tours by arrangement	NFAC, NAS Supercomputer, Flightline

December 2, 1987

NFAC DEDICATION CEREMONY

Friday, December 11 10:00 - 10:45 a.m.

PRELUDE	CONSTRUCTION OF NFAC, VIDEO
EVENT BEGINS	HISTORY AND FUTURE OF NFAC, VIDEO
WELCOME	DR. WILLIAM F. BALLHAUS, JR. DIRECTOR, AMES RESEARCH CENTER
PRESENTATION OF COLORS	US AIR FORCE COLOR GUARD TRAVIS AIR FORCE BASE
THE NATIONAL ANTHEM	STANFORD UNIVERSITY FLEET STREET SINGERS
INTRODUCTION OF SELECTED GUESTS	DR. WILLIAM F. BALLHAUS, JR.
REMARKS	DR. WILLIAM F. BALLHAUS, JR.
KEYNOTE ADDRESS	DR. RAYMOND S. COLLADAY ASSOCIATE ADMINISTRATOR, OFFICE OF AERONAUTICS AND SPACE TECHNOLOGY NASA HEADQUARTERS
ACT OF DEDICATION	DR. RAYMOND S. COLLADAY
CLOSING REMARKS	DR. WILLIAM F. BALLHAUS, JR.

NASA News

National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

For Release:

Release No. 87-62

FACT SHEET

National Full-Scale Aerodynamics Complex (NFAC)

The National Full-Scale Aerodynamics Complex (NFAC) which is composed of the modified 40-by 80-Foot Wind Tunnel, the new 80-by 120-Foot Wind Tunnel, and the Outdoor Aerodynamic Research Facility was designed to meet the critical needs of the United States for accurate full- and large-scale testing of advanced aircraft. The Complex includes the two wind tunnel test sections which share a common drive system, and an Outdoor Aerodynamic Research Facility.

Construction of the new facility was begun in July 1980. The Complex will become operational on December 11, 1987, following completion of initial testing studies.

SIZE: The Complex covers twelve acres. The closed circuit of the 40-by 80-Foot Wind Tunnel is one-half mile in length. Maximum air flow through the test section is 63 tons per second.

COST: $122.5 million

- more -

80-by 120-Foot Wind Tunnel

o Test section is 80 feet high, 120 feet wide, and 190 feet long

o Air intake is 130 feet high, 360 feet wide

o Air flow is open circuit; air enters through the inlet, passes through the test section, drive system, is diffused and exhausted back to the atmosphere

o Maximum speed in the test section is 115 mph.

40-by 80-Foot Wind Tunnel

o Test section is 40 feet high, 80 feet wide, and 80 feet long

o The tunnel is of closed circuit design; once air is put into motion, it is continuously circulated through the wind tunnel

Maximum speed in the test section is 350 mph.

Fan Drive System

The fan drive system propels the air through both test sections (only one tunnel can run at a time). The drive system is composed of six fans and motors with a total horsepower of 135,000 which consumes 105 megawatts of power. Each fan is 40 feet in diameter and the blades are variable pitch. The fans can be operated through a speed range of 36 rpm to 180 rpm and the blade pitch can be operated from -5 degrees to 52 degrees.

Acoustics

The test sections of both tunnels have been acoustically lined, which will keep background noise levels low and allow accurate measurements of noise. In the 80-by-120, splayed flow inlet vanes smoothly draw air in and keep sound propagating back through the inlet.

NFAC Research Areas

The NFAC is expected to play a major role in the research and development of new aerospace vehicles:

o High performance aircraft -- highly maneuverable, highly agile aircraft that can maneuver and land at low airspeeds

o High performance helicopters -- highly maneuverable, high-speed, low noise, low vibration helicopters of the future

o Advanced rotorcraft -- new aircraft that have most of the hovering abilities of helicopters and the high-speed abilities of conventional airplanes; for example:

-- Tilt-rotor aircraft -- a hybrid aircraft that can take off and land vertically like a helicopter, then tilt its rotors forward to fly horizontally like a conventional aircraft. Tilt-rotor aircraft will be able to achieve higher speeds and carry heavier loads faster than conventional helicopters, but still retain many of the hovering advantages of helicopters -- allowing this class of vehicles to help alleviate terminal area aircraft congestion. The tilt-rotor is expected to find widespread use in the future as an inter-city commuter aircraft and as a military transport vehicle.

- more -

-- Stopped-rotor (X-Wing) craft -- a helicopter with jet engine propulsion whose rotors can be stopped in flight and function as wings. Like the tilt-rotor, the X-Wing will be able to achieve faster speeds than helicopters, but still retain many of the helicopter's vertical takeoff and landing abilities.

o Powered lift V/STOL aircraft -- aircraft with engines that can deflect high-volume, high-speed air downward, allowing the aircraft to take off and land in short distances and hover in mid-air. V/STOL fighters will be valuable for aircraft carrier use, and in terrain with bombed-out, or weather-damaged runways, or where full-size runways are unavailable. NFAC will test supersonic V/STOL aircraft in the critical hover and low speed flight regimes.

NFAC will be used to conduct fundamental research in flow phenomena and aeronautical acoustics, including these areas:

o large-scale (high Reynolds number) fluid flow problems
o full-scale/model-scale experiments to determine aerodynamic scaling laws
o rotor and propulsive lift noise
o rotor/fuselage/tail rotor interactions
o jets operating in cross-flows.

Programs now scheduled or expected to undergo NFAC testing include:

o V-22 Tilt-Rotor Osprey
o 698 Twin Tilt-Nacelle VSTOL
o Model E-7 Advanced Ejector Concept (powered lift aircraft)

o Helicopter Advanced Rotor Program -- with advanced hub and rotors for low noise and low vibration and high speed flight

o Army LHX helicopters program

o National Rotorcraft Noise Reduction Program

o U.S./U.K. Advanced Short Take off and Vertical Landing (ASTOVL) Program.

Others are a variety of advanced aircraft, such as:

o F-18 fighter at high angles of attack

o planned airfield to orbit Aero-Space Plane

o advanced Shuttle-type aircraft

o future supersonic transports.

USERS: NFAC is a national facility, available for use by government agencies, industry, universities and other researchers.

The "40-by-80"

NFAC represents a major modification and restructuring of an existing wind tunnel, the 40-by-80, previously "the free world's largest wind tunnel." An entirely new, and much larger, test section, the 80-by-120, has been added, more than doubling potential total test capabili+v of the Complex.

Construction of the "40-by-80" was begun in 1941 and completed in 1944. Until now the free world's largest wind tunnel, the 40-by-80 originally covered eight acres. It had six 6,000 horsepower motors and a maximum speed of 230 mph. In forty years more than 500 aircraft and models, including most of the nation's major aircraft designs, were tested in the 40-by-80. Contributions include:

o post-War -- helped in lowering landing speeds -- of crucial importance to aircraft carriers aviation

o 1950's -- helped in improving stability and control systems for new jet aircraft, lowering jet landing speeds

o 1960's and 1970's -- development of more efficient, more stable, safer helicopters; research on VSTOL, conventional aircraft and spacecraft.

December 4, 1987

NASA News

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Ames Research Center
Moffett Field, California 94035
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Peter W. Waller 415/694-5091

For Release:

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Release No. 87-63

PIONEER 8 CELEBRATES 20TH YEAR OF SPACE OPERATIONS

After some 11 billion miles of interplanetary travel, Pioneer 8 will celebrate 20 years of operation on Sunday, December 13, 1987.

The 140-pound satellite was launched into solar orbit on December 13, 1967 from Cape Canaveral, Fla. Although design specifications called for the spacecraft to last six months, NASA's Ames Research Center, Mountain View, Calif., continues to receive signals from Pioneer 8 two decades later.

Pioneer 8 was the third satellite in a four-spacecraft series. It was built for NASA by TRW, Redondo Beach, Calif. Pioneers 6, 7, 8 and 9 were all designed to study solar flares and related phonomena.

NASA scientists say the series provided valuable information on the turbulence of the solar wind and how the wind affects the Earth's magnetic fields. The first satellite in the series, Pioneer 6, is the oldest functioning spacecraft in interplanetary space. It will celebrate 22 years of operation on December 16. The only satellite in the series that is not operating is Pioneer 9, which was launched in 1968. NASA officially declared Pioneer 9 dead earlier this year.

- more -

One of the accomplishments of Pioneer 8 is its confirmation that the Earth, like a comet, has a magnetic tail, says Dr. Frederick S. Scarf. TRW physicist Scarf is the principal investigator of the only experiment still functioning aboard Pioneer 8, the plasma wave experiment. Scarf says that while Pioneer 8 was not the first spacecraft to detect the tail, that data provided by the satellite has helped scientists piece together a fuller picture of the Earth's "geotail."

According to Dr. Scarf, one of the unique aspects of his experiment's instrument, the electric field detector, is the fact that it has been resurrected.

"It was turned off for 13 years -- from 1971 to 1984," he explains. Scarf had a more advanced version aboard Pioneer 9 (launched in 1968) and NASA suggested that the electric field detector aboard the older satellite be turned off to save the cost of monitoring it and to conserve power.

He was happy to oblige, but after NASA lost contact with Pioneer 9, and it appeared that Pioneer 8 was about to pass through the Earth's tail in 1984, commands were sent to turn his instrument back on.

"It responded immediately after 13 years in hibernation," Scarf recalls.

When launched, Pioneer 8 was equipped with eight instruments. All but the electric field detector have stopped providing information, either because of the failure of the spacecraft's solar sensor or its degraded solar power. NASA scientists suspect that the large number of solar flares that Pioneer 8 has been exposed to and its long, relatively close exposure to the Sun's ultraviolet radiation have damaged these power systems.

Pioneer 8 has transmitted an estimated 11 billion bytes of information during its 20-year lifetime. It orbits the Sun once every 388 days at a distance from Earth that ranges from 2 million to 186 million miles. Like the other spacecraft in the series, it measures 37 inches in diameter and 32 inches long.

December 10, 1987

NASA News

National Aeronautics and
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Ames Research Center
Moffett Field, California 94035
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Release No. 87-64

For Release:

December 14, 1987

Les Reinertson
Headquarters, Washington, D.C
(Phone: 202/453-2754)

C. J. Fenrick
Ames Research Center, Mountain View, Calif.
(Phone: 415/694-5091)

SUPERCOMPUTER FIRM SELECTED BY NASA FOR CONTRACT AWARD

NASA's Ames Research Center , Mountain View, California has awarded Cray Research, Inc., Minneapolis, Minn., a firm-fixed price contract for acquisition of an Initial Computer System with an option for a High Speed Processor 2 (HSP-2) Computer System for use in the Numerical Aerodynamic Simulation Processing System Network.

The acquisition consists of leasing the initial system for one 12-month period (phase 1); the option to lease the HSP-2 system, which will replace the initial system, for one 36-month period; and additional fixed price hardware upgrade options.

The contract, scheduled to begin Dec. 15, 1987, has a total value of $54,083,372, consisting of $7,524,488 for phase 1, $36,438,348 for phase 2, and $10,120,536 for the hardware upgrade options.

The Initial System will be capable of performance exceeding 250 million floating-point operations per second in sustained computation with at least 500 million bytes of common memory and at least 25 billion bytes of high-speed mass storage. The HSP-2 System will be capable of performance exceeding one billion floating-point operations per second in sustained computation with at least two billion bytes of common memory and at least 50 billion bytes of high-speed mass storage.

The work will be performed at NASA-Ames Reserach Center, Moffett Field, CA.

-end-

December 14, 1987

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Tuesday, December 22, 1987
10:00 a.m. PST

Release No. 87-65

EARLY VENUS MAY HAVE HAD OCEANS ACCORDING TO NEW PLANET HISTORY

Venus may have had hot, planet-spanning oceans for hundreds of millions of years before it lost them, according to a new planet evolution theory and NASA spacecraft data.

The new history for Earth's twin planet solves several Venus mysteries. It explains many of the extreme conditions found on Venus today.

Called the wet greenhouse theory, the explanation was developed by Drs. James Kasting, Tom Ackerman, and James Pollack, of NASA's Ames Research Center, Mountain View, Calif.

The work suggests that Venus had relatively Earth-like conditions during its early history. It also suggests (as many scientists now believe) that Venus, Earth, and Mars formed from similar interstellar materials, and that all three originally had substantial amounts of water. Spacecraft may yet find geological and erosion evidence of early bodies of water on Venus, as they already have on Mars.

The wet greenhouse theory with its oceans far better explains Venus than the "runaway greenhouse" model now used. It accounts for the first time for the almost completely waterless state of the present-day planet. It explains where the planet's missing oxygen is stored.

-more-

(Scientists report that related "greenhouse" conditions on Earth, created by the burning of fossil fuels, are heating the Earth's environment. A number of them forecast partial melting of the polar ice caps and flooding of coastal cities within the next century.)

Ironically, the presence of early oceans on Venus may well account for the incredibly dry condition of today's planet.

Venus today is a scorching, hell-like place -- totally dry, with a surface temperature hotter than the melting point of zinc (800 degrees F) and an enormously heavy, largely carbon dioxide atmosphere, 100 times as dense as Earth's.

Venus's original atmosphere -- of about 4 billion years ago -- is believed to have been much like Venus's atmosphere today: many times denser than Earth's and mostly carbon dioxide.

Dr. Kasting's "wet greenhouse" theory suggests that this enormous primordial atmosphere was reduced to a small part of its original mass by ocean-planet interactions. This would have left Venus's atmosphere about the same size as Earth's. The thin Earth-like atmosphere then lasted several hundred million years. Eventual loss of most of the water from such a thin Earth-like atmosphere would have stripped the planet of its water, leaving it bone dry as Venus is today.

By contrast, the currently-accepted "runaway greenhouse" theory assumes the continuous presence of an extremely heavy atmosphere. Loss of the same proportion of water from this atmosphere still leaves us with far too much water -- 100 to 1,000 times what we actually find on Venus.

The old and new theories go as follows:

In the runaway greenhouse, Venus's huge primordial atmosphere would have trapped much of the Sun's heat, preventing formation of any oceans at all, and creating a dense water vapor-carbon dioxide atmosphere. An immense amount of water vapor would have risen to the top of the atmosphere. Solar ultraviolet radiation would have split (dissociated) the water molecules into hydrogen and oxygen. The hydrogen (the lightest gas) would have blown away to space by the super-fast hydrodynamic escape process -- and been lost forever -- destroying this water.

However, highly efficient hydrodynamic escape would have stopped when water was reduced to a minor constituent of the atmosphere (around 20 percent). But even 20 percent of an enormous atmosphere like Venus's is still a lot of water, and much of this water should be left on the planet today. However, the four atmosphere probes of NASA-Ames' Pioneer-Venus spacecraft didn't find it there.

This amount of leftover water would be enough to make an atmosphere (if it consisted of nothing else but water vapor) ten to twenty times as dense as the entire atmosphere of Earth.

Kasting's "wet greenhouse" theory answers this surplus water objection:

Venus formed with plenty of original water which condensed out and created Earth-scale oceans. The oceans were hot because of the planet's closeness to the Sun and the trapping of incoming solar heat by atmospheric carbon dioxide and water vapor.

Because Venus's surface was so hot, much of the oceans evaporated until perhaps 50 percent of the atmosphere was water vapor. However, at this point the oceans won out. Water vapor pressure had built up so high that it prevented further evaporation from the oceans -- just as does the water vapor in a kitchen pressure cooker. The oceans were very hot, 200-300 degrees F (around boiling temperature on Earth). Yet because of the high vapor pressure of atmospheric water vapor, the bulk of the water on the planet remained liquid. Hydrogen would still have escaped rapidly from the top of the atmosphere by the super-efficient hydrodynamic escape mechanism. But the atmospheric water lost this way would have been steadily replenished by further evaporation from the underlying ocean.

-more-

By remaining liquid over millions of years, the oceans were able to move the original huge mass of carbon dioxide gas out of the atmosphere. They did this by converting most of this gas into carbonate rocks in Venus's crust. (These are the same multi-step, ocean-planet interactions that have converted Earth's enormous mass of carbon dioxide into carbonate rock.) This process (generally described as "weathering") reduced the atmospheric density on Venus from perhaps 90 times Earth's atmosphere to perhaps only about the same density as Earth's atmosphere.

In both greenhouse theories, when water vapor dropped to around 20 percent of the atmosphere, hydrodynamic escape ceased to push hydrogen off the planet, and destroy its water.

But 20 percent of a thin Earth-size atmosphere is about 100 times less water than 20 percent of an enormous, Venus-type, carbon dioxide atmosphere. This means that in the wet greenhouse model by the time hydrodynamic escape had ended, with its thin Venus atmosphere, nearly all of Venus's water was lost. Slower hydrogen escape processes in the several billion years since then have reduced the planet's water still further to today's tiny amount.

Most scientists believe Venus originally had water because Earth and Mars have abundant water. (Mars' water is frozen.) Formation conditions of all three planets were similar. The building blocks of all three were dust and ice grains circulating freely in the interstellar gas cloud that formed the solar system. These primordial materials are believed to have been reasonably well mixed in a very wide inner-planet region.

The Pioneer probes showed that today's totally dried out Venus has only a tiny quantity of water. Venus has only a hundred thousandth as much water as the Earth.

Kasting's "wet greenhouse" with oceans helps clear up another Venus mystery. If most of the planet's water split into

-more-

hydrogen and oxygen, and all the hydrogen blew away to space, where is the oxygen that was left behind? The four Pioneer probe craft didn't find it in the atmosphere.

Many scientists believe that much of the missing oxygen is locked up in the planet's crust. It has combined into such oxygen-rich minerals as hematite and magnetite.

However, to get the crust to lock up this much oxygen, an efficient mechanism for remixing the planet's surface rocks is required. A few hundred million years of precipitation, erosion, and weathering produced by Venusian oceans may well be this mechanism.

Says Kasting, "if you assume that oxygen was removed from Venus's atmosphere by erosion and weathering at a rate comparable to present weathering rates on Earth, you can start out with Venusian oceans about a tenth of the total volume of Earth's."

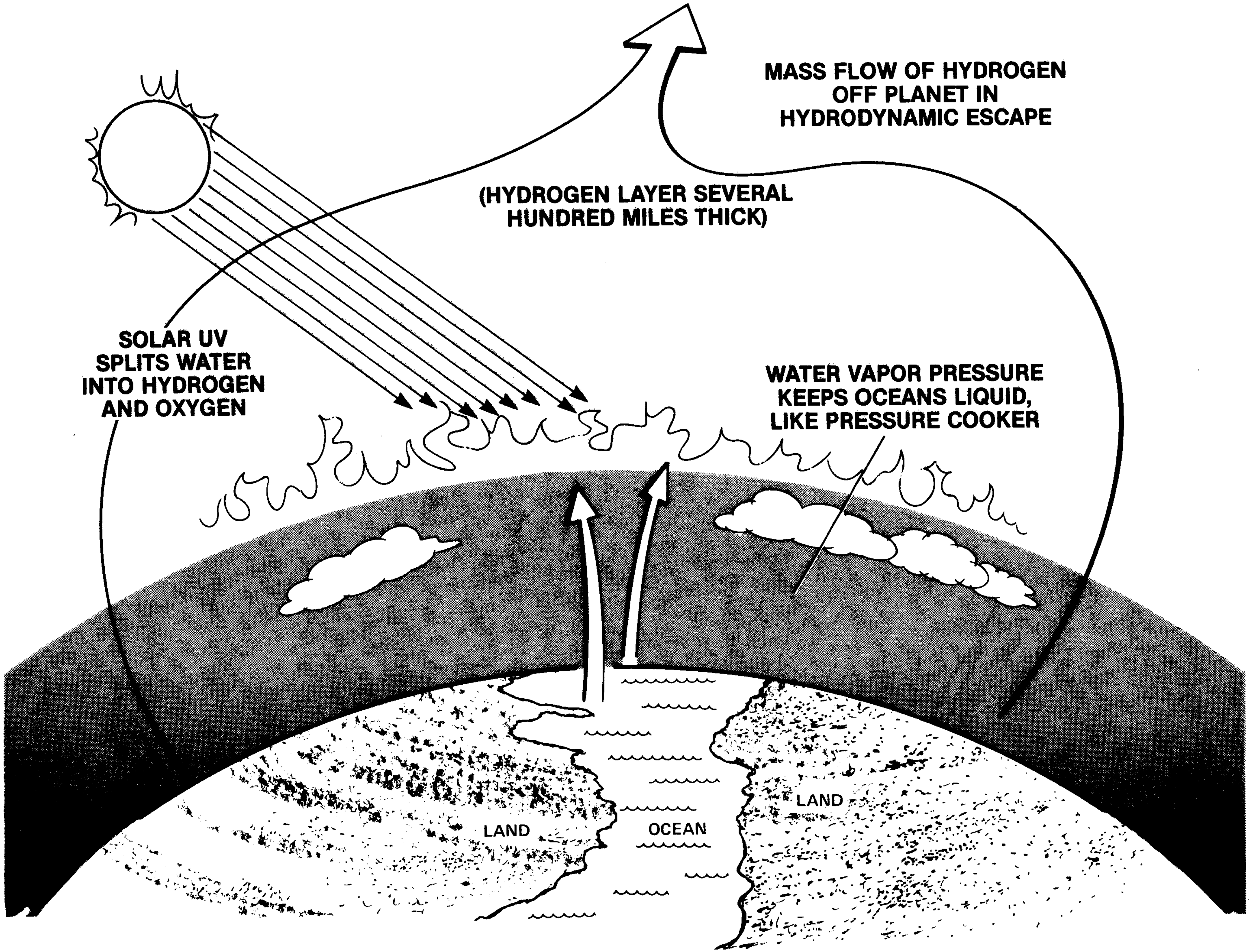
More recent work by Dr. Kevin Zahnle at NASA-Ames suggests that even larger oceans are possible. If the hydrodynamic escape was vigorous enough -- due to enhanced ultraviolet heating from a magnetically active young Sun -- much leftover oxygen may have been dragged into space with the hydrogen. Then no trace of the original water would remain, and Earth-sized oceans are easier to explain.

If Venus had oceans for several hundred million years, even at near boiling temperatures much of the time, there is a chance that life could have arisen.

"Most researchers would probably say these temperatures were too hot," says Kasting.

"But early Earth may also have been hot when life began because of the greenhouse effect of a dense carbon dioxide atmosphere just like Venus's. It would be premature to rule out the possibility that life arose on Venus when we know so little about its origin here."

“WET GREENHOUSE” THEORY FOR VENUS



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Ames Research Center
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Release No. 87-66

NOTE TO EDITORS

A new history of Venus suggests that the early planet had oceans for millions of years, something like Earth -- and that paradoxically these same early oceans explain the total lack of water on the planet today.

The new history of Earth's twin planet is based on the new "wet greenhouse theory" of the planet's evolution -- a change from a runaway greenhouse explanation for Venus.

The histories of Venus and Earth are very different, and only general lessons for Earth can be learned from studying Venus. However, Earth currently has a greenhouse effect due to the burning of fossil fuels and many scientists expect this to warm the climate and cause melting of polar ice caps over the next hundred years.

NASA-Ames Research Center's scientists will hold a news briefing on the new "wet greenhouse theory" for Venus at 10:00 a.m. on Tuesday, December 22.

A television newsclip and photographs of the planet will be available. Reporters planning to attend should come to the Ames Reception Center at Moffett Field and will be directed from there.

December 16, 1987

NASA News

National Aeronautics and Space Administration

Washington, D.C. 20546
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Debra J. Rahn
Headquarters, Washington, D.C.
(Phone: 202/453-2754)

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Pete Waller
Ames Research Center, Mountain View, Calif.
(Phone: 415/694-5091)

RELEASE: 87-98

NASA AMES LARGE WIND TUNNEL REOPENS

The world's largest wind tunnel reopens today at NASA's Ames Research Center, Mountain View, Calif., with greatly increased test capabilities after undergoing major modifications.

Called the 40-By-80-Foot Wind Tunnel reflecting the size of its test chamber, the tunnel was constructed in 1944 and has been used to test most of the nation's important aircraft for the last 40 years. The 40-by-80 is large enough to test many full-scale aircraft, hence eliminating some of the uncertainities of scale model testing.

Before modification, the big tunnel was powered by six 6,000-horsepower electric motors which generated airspeeds up to 230 mph. It now has six 22,500-horsepower motors. This additional power increases the tunnel's drive power from 36,000 to 135,000 horsepower and has pushed its top test speed from 230 mph to 345 mph.

The tunnel has been important in full-scale testing of civilian and military aircraft, including concepts such as advanced fighters, supersonic and subsonic transport aircraft, vertical and short takeoff and landing aircraft and rotary wing craft.

The overseas sales of these U.S. aircraft has long been the largest earner of foreign exchange for the United States with the exception of agriculture. The major improvements in this unique national facility, therefore, are important to both the industry and the country.

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Today, the first phase of the National Full-Scale Aerodynamics Complex (NFAC), the modified 40-By-80-Foot Wind Tunnel, is ready for research operation. The second phase, which includes the new "straight through" leg with its 80-by-120-foot test section, is expected to be complete in late 1987.

Modifications to the improved 40-by-80 include the following: 1) introduction of a 6-inch acoustic liner in the test section to reduce noise and aid in acoustic testing of helicopters; 2) automated fan drive and model support controls to increase test productivity; 3) upgraded data acquisition system with an increased number of data collection channels; 4) new electronic model force measurement system to provide more reliable measurements of overall aerodynamic forces; 5) a new air exchanger that releases hot air from the tunnel circuit and brings in cool air, allowing the tunnel to operate for longer periods of time; and 6) new corner flow turning vanes to reduce required drive power and maintain high test section flow quality.

Construction of the 40-by-80 was completed early this year. Extensive testing through the full operational envelop are now complete and test section flow calibration is in progress.

The repowered tunnel will operate much as it has since 1944 with air being driven around a closed loop through the 40-by-80-foot test section, but at the higher top speed of 345 mph.

The facility will be important in low-speed testing of aircraft with engines running. Since all aircraft must pass through this speed range during takeoff and landing, the tunnel promises to be as useful in major projects of the future as it has been for the last 40 years.

Results of such tests then can be used in an attempt to reduce aircraft noise during takeoff and landing, develop high-lift systems to reduce takeoff and landing distance and improve airplane flight performance in congested terminal areas. With the increase in size and speed of vertical lift vehicles, such as helicopters and other aircraft developments, a more extensive research facility than even the improved 40-by-80 was necessary.

To meet this need, the closed-loop 40-by-80-foot tunnel has been converted to two tunnels which share a common drive system. A second "straight through" structure with a test section of 80-by-120 feet has been added to the old 40-by-80.

The overall renovation project is known as the National Full-Scale Aerodynamics Complex (NFAC). The complex includes the Outdoor Aerodynamics Research Facility, a pretest station prior to 40-by-80 aircraft testing. Total cost of modifying and constructing these new facilities will be $122.5 million.

During NEAC development testing in December 1982, the slippage of a mechanical linkage in a vane set resulted in extensive damage to the facility, delaying completion. The damage has been repaired and the redesigned facility, resulting from the accident, will make the NFAC more productive and efficient than before.

NFAC's second phase, the new 600-foot long structure with a test section 80-by-120 feet in cross section, will receive air through an intake 360 feet wide and 130 feet high. Air traveling at 115 mph will pass through the test section and drive system and be released through vanes located in the south wall of the 40-by-80-foot facility.

The two tunnels cannot be operated simultaneously since both share a common drive system. However, there is full access to the 80-by-120-foot test section during closed-circuit operation allowing for model preparation and checkout there prior to tunnel testing.

- end -

This release and other NASA information is available electronically through ITT Dialcom. For access to NASA News through this system, contact Jim Hawley, ITT Dialcom, Inc. at 202/488-0550.

A photograph to illustrate this news release will be distributed without charge to media representatives. The photograph may be obtained by writing or calling:

Broadcast and Audio/Visual Branch, LM
NASA Headquarters, Washington, D.C., 20546

(Phone: 202/453-8383)

Photograph Number:

B&W: 87-H-145 Line Drawing

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National Aeronautics and
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Ames Research Center
Moffett Field, California 94035
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Peter Waller, Linda Blum 415/694-5091

For Release:

January 12, 1988

Release No. 88-1

NEW ALL-HARD SPACESUIT DEVELOPED FOR U.S. SPACE STATION

An advanced spacesuit, intended for use on the U.S. Space Station program, has been developed at NASA's Ames Research Center in Mountain View, Calif. The spacesuit, known as the AX-5, is designed for routine, daily space operations -- far more use than previous spacesuits.

The AX-5 is made of aluminum, and contains no fabric or soft parts. The suit will provide extremely high reliability, will vastly reduce maintenance, and will enhance mobility and comfort. It can operate at up to normal atmospheric pressure, and will shield against radiation and impact from small meteorites and space debris.

The AX-5 was designed to meet the specifications of the U.S. Space Station, but it can be modified for use on other Earth-orbiting missions or for interplanetary missions, such as a trip to Mars. The suit was developed at NASA-Ames by spacesuit designer Hubert C. "Vic" Vykukal. It is one of two spacesuit designs which are being considered for use on the Space Station. The AX-5 departs radically from other spacesuits in being constructed completely of hard material. "The hard suit will enable us to use current aerospace techniques all along the way, from initial design tests to maintenance," Vykukal said.

-more-

Because the AX-5 is made of solid metal and has just 15 major parts, it is expected to enhance reliability and safety required for extensive Space Station operations.

"The AX-5 is the most advanced spacesuit yet developed," said Chief of Aerospace Human Factors Research Dr. David C. Nagel. "In terms of its potential for prolonged, repeated use, it is a revolutionary design." Mobility of the AX-5 is achieved by a unique arrangement of rotary bearings at the joints, which allows for a nearly full range of astronaut motion. The effort involved in working in the suit is minimized by this design because the suit maintains a constant volume and, hence, a constant internal pressure, no matter how it is flexed.

The suit will be able to operate for several years in space with just minimal maintenance. Because the AX-5 is modular, any one part which needs to be serviced can easily be removed and replaced on-board the Space Station. The current operational suit requires a major overhaul on Earth after every mission and 30 to 50 hours of use.

During the past three months, in the first of a year-long series of studies, the spacesuit has been tested by immersion in water to simulate weightlessness at Ames' Neutral Buoyancy Test Facility. NASA astronauts will continue these studies in an extensive series of tests which will begin in early 1988 at NASA's Lyndon B. Johnson Space Center Weightless Environment Test Facility, located near Houston, Texas. The astronauts will evaluate the suit's comfort, mobility, and performance in simulated space missions.

Since the hard material that the suit is made from is dense, it will provide an effective shield against radiation, while minimizing bulk. The hard structure will also provide protection against impact from micrometeoroids and human-made "space junk," floating in Earth orbit.

The spacesuit will be coated with a microscopically-thin outer layer, which may be pure gold or aluminum, to protect against corrosion and to provide good thermal insulation. (This will be so thin that an entire spacesuit would require less gold than a necklace.) In the Space Station environment, the suit may be exposed to corrosive, toxic fuels such as hydrazine, as well as to ambient atomic oxygen in space, which is highly reactive. Gold, one of the most inert elements known, can tolerate these substances.

The coatings will also protect against the severe thermal environment of space. Spacesuits must be built to withstand enormous temperature fluctuation. In Earth orbit and without protection, the side of the suit facing the Sun may reach searing 400 degree F temperatures, while the other side, facing deep space, could get as cold as -250 degrees F.

Like its predecessor the AX-3, the first high-pressure spacesuit prototype, the AX-5 can operate at up normal Earth atmospheric pressure of 14.7 pounds per square inch (psi). Current Space Station guidelines call for a lower pressure of 8.3 psi to be used to allow greater mobility for the hands. Suitable gloves that can allow operations at pressures above 4.3 psi have yet to be developed.

The suit is entered through a hatch in the rear, with the legs put in first, followed by the upper part of the body. Putting on or taking off the suit takes only a few seconds, compared to several minutes for the current space shuttle suit. The AX-5 has joints permitting movement at the shoulder, elbow, hip, knee, and ankle. Between the joints, rings of various sizes can be added, allowing the suit to fit people ranging from 4 feet 10 inches to 7 feet in height. The suit has a 13-inch diameter helmet, allowing wearers to turn their heads for a wide field of view.

Like other advanced spacesuits, which operate at 8.3 psi and above, the AX-5 eliminates the breathing of pure oxygen to adapt the body before entering a low-pressure environment. Pre-breathing, which can take up to five hours with low-pressure suits, prevents the bends, a serious condition in which dissolved nitrogen in the blood bubbles out at low pressure.

As in all NASA spacesuits since Apollo, thermal control of the AX-5 will be maintained by a separate backpack which controls a liquid coolant garment, a network of fine tubes of flowing water worn beneath the spacesuit. The backpack also supplies gases for breathing, and cleanses the air of exhaled carbon dioxide and moisture.

(News representatives may obtain photos and videotapes of the AX-5 from Ames Research Center (415/694-5091)).

January 4, 1988

NASA News

National Aeronautics and
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Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

For Release:

Peter W. Waller 415/694-5091
Linda Blum

Immediate

Release No. 88-2

GALILEO PROBE PREPARED FOR LONGER LIFE

Work to prepare the Galileo Space Probe for a longer lifetime than initially planned is underway at NASA's Ames Research Center (ARC), Mountain View, Calif., and Hughes Aircraft, El Segundo, Calif.. The Probe is scheduled to enter Jupiter's "brilliantly-colored" cloud banks in late 1995, becoming the first spacecraft ever to enter the atmosphere of ~~another~~ AN OUTER planet.

Age assessment studies have been completed and tests of the Probe's major operating subsystems will begin in December. The Probe now is being reassembled and refurbished at Hughes, after return from storage at NASA's Jet Propulsion Laboratory (JPL), Pasadena, Calif., in September.

Several of the Probe's components will need to be rebuilt to counter potential problems due to aging. Parts to be rebuilt include: the parachute which will slow the Probe as it descends through Jupiter's atmosphere; the lithium sulfur dioxide batteries; the mortar cartridge, which deploys the pilot parachute; and the pyrotechnic pressure cartridges, used as cable cutters and separation nuts, to help separate the Probe from the orbiter. The cost of replacing these parts will be roughly $1.5 million, according to Probe manager Benny Chin of ARC.

- more -

Four of the Probe's six scientific instruments have been checked and found flightworthy. A fifth instrument is under review, and a sixth instrument, the net flux radiometer, which will measure energy being radiated by Jupiter and the Sun, is being refined to achieve greater precision.

Three major systems will undergo detailed performance tests. They are the telemetry and command system, which processes data and controls the spacecraft; the power system; and the radio transmitter system.

Because the Galileo mission has been delayed several times as different launch vehicles and mission plans have been considered, the spacecraft will be 8-years-old at launch in 1989. Chin commented, "With each delay, the risks of the Probe not completing its mission are somewhat greater because of the aging of parts. However, we're confident that we're minimizing that risk as much as possible through our age assessment and testing procedures."

Launch of the Galileo Probe and Orbiter is now scheduled for October 1989. Galileo will follow a complex new flight path to Jupiter to compensate for launch from a less powerful upper-stage rocket than had earlier been planned. The Centaur liquid-fueled, upper-stage rocket program was canceled for safety reasons after the shuttle accident. Galileo will now use the U.S. inertial upper-stage rocket.

The new flight plan, known as the Venus-Earth-Earth-Gravity-Assist trajectory, calls for Galileo to take three energy-boosting gravity assists in the inner solar system. First, Galileo will swing in to Venus in Feb. 1990, to pick up energy from Venus' gravitational field. The spacecraft will then return back to Earth, where it will pick up gravitational energy and circle the sun. It will return to Earth for a second assist before embarking on its final, non-stop trajectory to Jupiter in 1992. The Galileo Probe will be carried to within 48,000,000 miles of Jupiter by the Galileo Orbiter.

-- more -

When Galileo nears Venus, it will be exposed to greater solar heating than expected by earlier flight plans. Additional insulation is not needed, because mission experts will keep Galileo pointed continuously toward the Sun while in the inner solar system. The Probe, located in the rear of the Orbiter, will remain in the shade throughout this phase of the mission, and will stay relatively cool. The Orbiter is now undergoing extensive modification at JPL to gain additional thermal protection. Only the Probe's link antenna, which is located on the Orbiter, will need to be insulated.

The Probe has been designed to withstand extremely difficult entry conditions at Jupiter. It will slam into Jupiter's atmosphere at 100,000 miles per hour. Deceleration to Mach 1 will take less than 2 minutes, causing inertial forces, at maximum deceleration, to reach up to 350 times Earth's gravity. The build-up of heat in the gases, in front of the probe nose cone, will be as intense as a nuclear explosion.

After its fiery entry, the Probe will descend 150 miles through Jupiter's main cloud layers, generating data on the planet's chemical composition, turbulent winds, atmospheric structure, lightning and heat flux. For most of this period, the Probe will operate in a relatively benign environment, immersed in gases at or below room temperature.

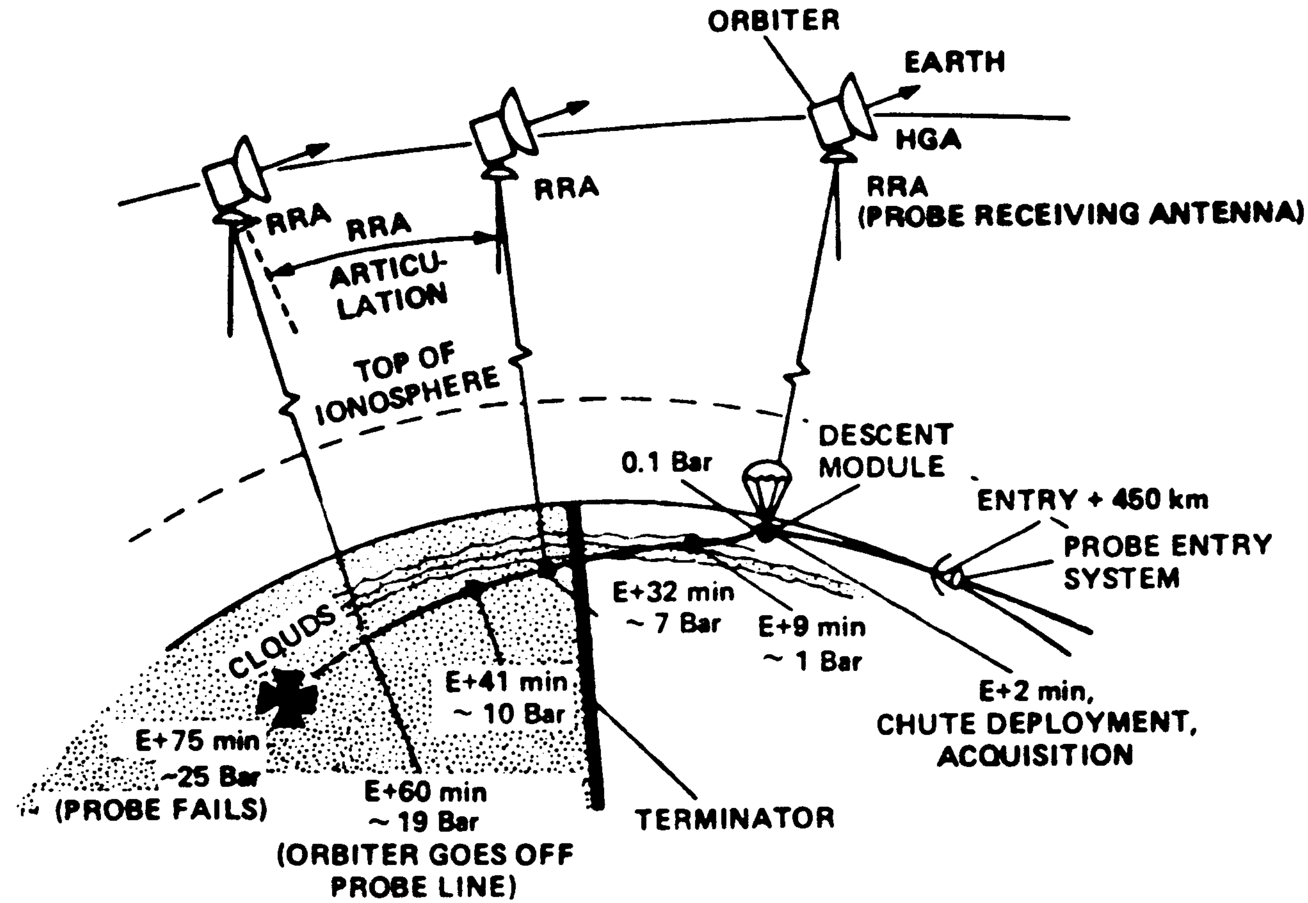
Pressures will reach 15-20 times Earth's sea level pressure by the end of the 75 minute probe mission. Eventually pressure will crush the craft.

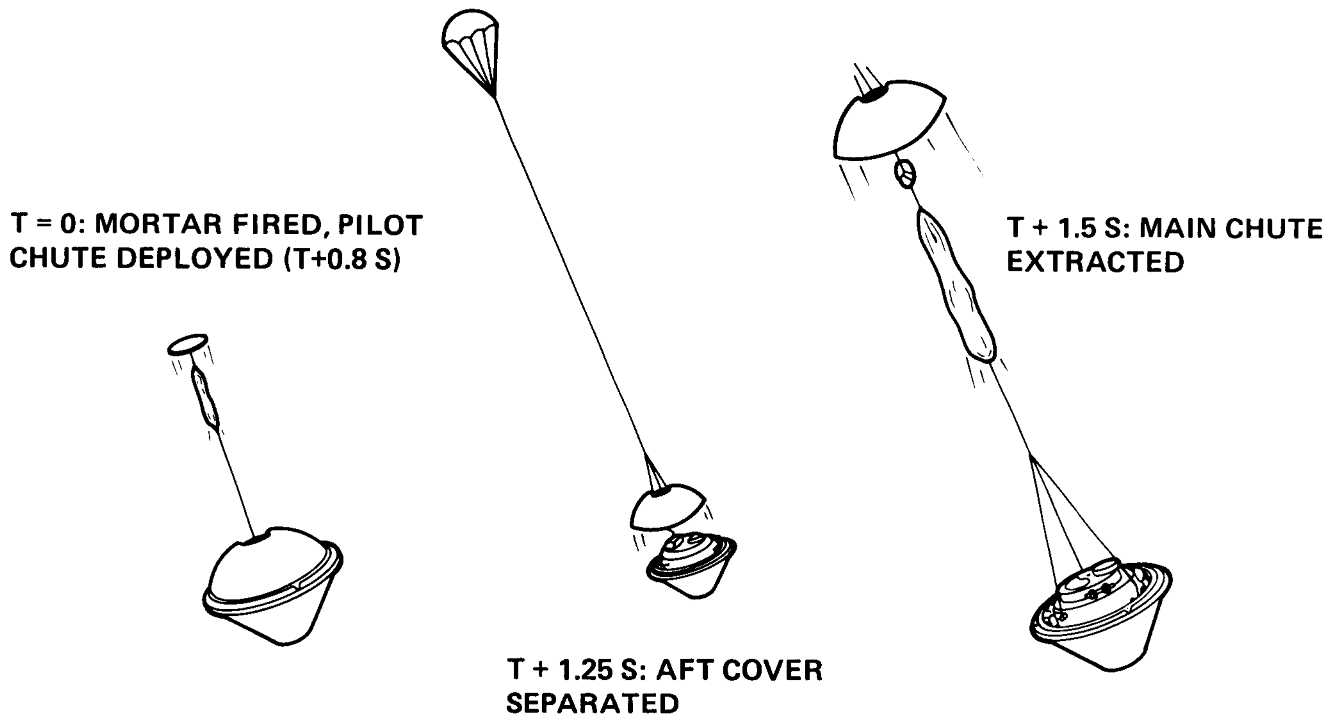
The probe will separate from the orbiter 150 days before the Probe's entry. The orbiter will continue to function for 22 months, orbiting Jupiter at least ten times and closely studying the giant planet, its major satellites and large magnetosphere.

-end-

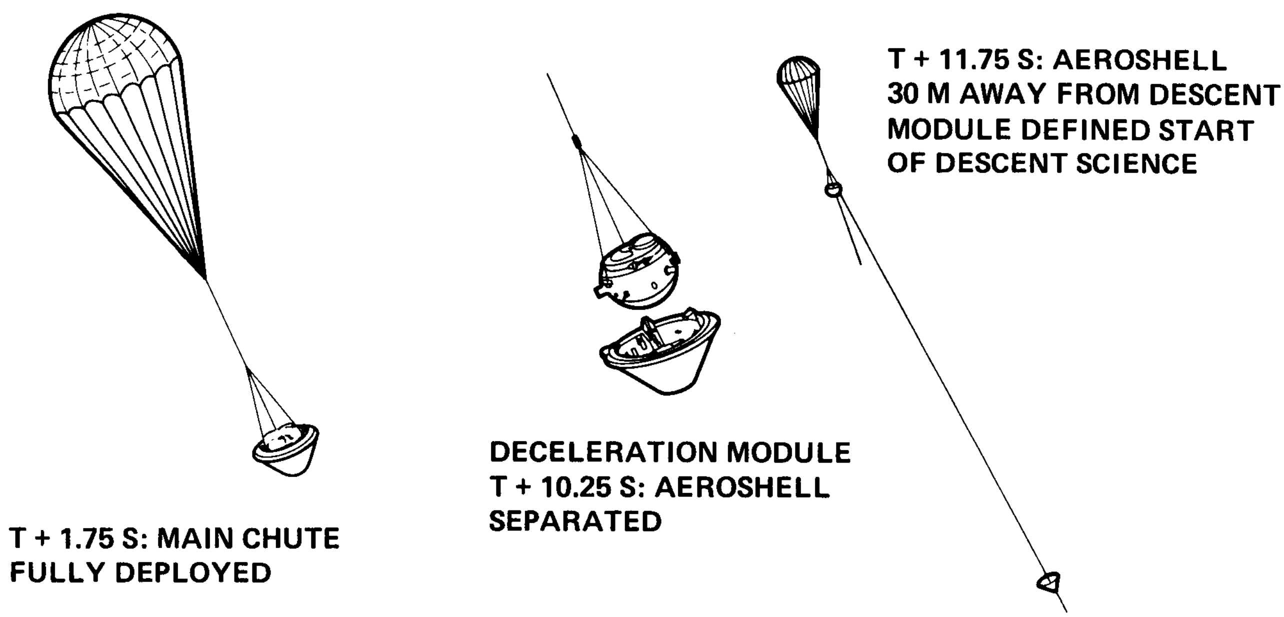
December 21, 1987

ORBITER OVERFLIGHT

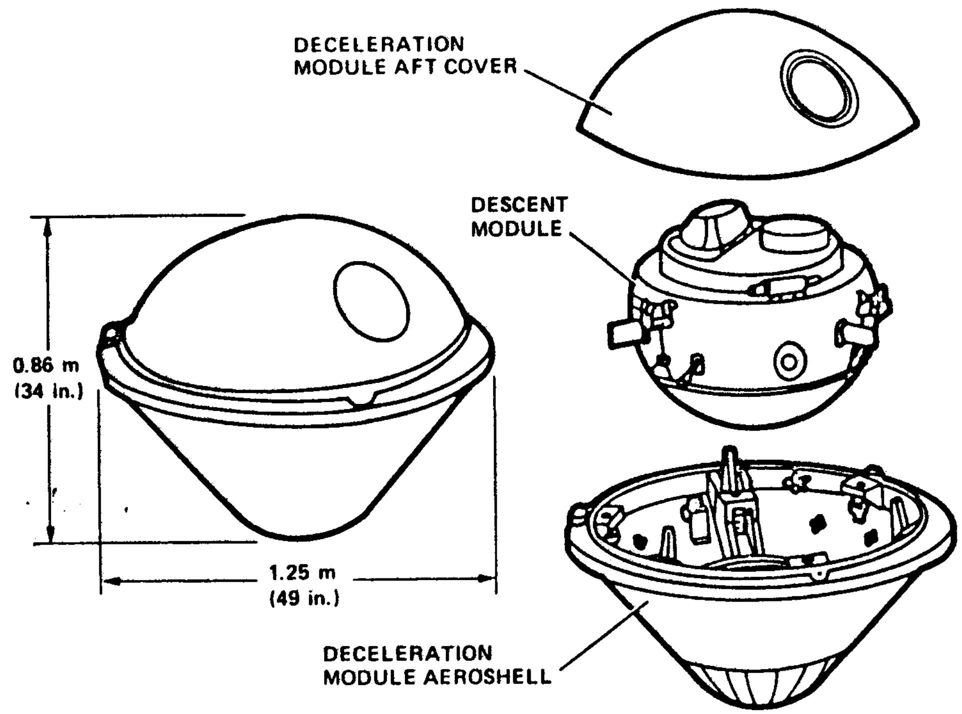




Deceleration Module Staging Sequence



Deceleration Module Staging Sequence



Probe configuration.

NASA News

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AC 415 694-5091

Peter W. Waller 415/694-5091
Linda Blum

For Release:
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Release No. 88-04

NASA SUPERCOMPUTER STUDIES AIRCRAFT CONTROL PHENOMENON

Using NASA's new supercomputer system called the Numerical Aerodynamics Simulation Facility, a researcher has made by far the most in-depth analysis to date of vortex breakdown, a complex phenomenon which can cause loss of lift and control for high-performance aircraft.

A computer model, developed by Dr. Kozo Fujii, a research fellow at NASA's Ames Research Center, Mountain View, Calif., simulates the air flow field physics associated with vortex breakdown and provides new insights into its causes. Vortex breakdown is difficult to study experimentally and has remained poorly understood.

Above the upper aircraft wing surfaces, vortices of swirling, low-pressure air flow create increased lift for fighter-type aircraft. With the aircraft's nose pitched up at a high angle to its flight path, these vortices can burst, causing a loss of aerodynamic lift. Once this breakdown occurs, air flow may become asymmetric, which can lead to loss of aircraft control, sending it into a roll.

Understanding and eventually controlling vortex breakdown will lead to greater maneuverability and safety for high-performance aircraft. The Ames work also may be useful in other fields involving vortical flow, such as weather modelling.

- more -

The Ames computer model is the first computational analysis to predict spiral breakdown, thought to be the most common type of breakdown over aircraft wings. Bubble breakdown, the other major type, also is predicted.

Fujii's model of breakdown also is the first to utilize a real wing configuration, rather than a simplified form. The model tracks vortex breakdown on strake delta wings such as those found on F-16 and F-18 aircraft. It can be adapted for use with a variety of wing configurations.

The model is three-dimensional, time-accurate and highly detailed, with the flow field calculated at 850,000 grid points. It is based on the Navier-Stokes equations, a highly complex set of equations describing how fluids behave, and requires 25 hours running time on an advanced supercomputer.

The model is already providing clues to the causes of spiral breakdown. Under certain conditions, Fujii has found that spiral breakdown occurs only when the vortex breakdown interacts with the viscous layer on the surface of the wing, suggesting that this interaction may cause the breakdown. Fujii would like to find someone to test this experimentally to confirm the finding.

Vortex breakdown is difficult to test experimentally because the phenomenon is unstable, changing rapidly over short periods. Since breakdown occurs in the flow field above the wing surface, many experimental probes interact with the vortex flow field, distorting the measurements. Computational methods permit studying breakdown without disturbing the flow field and allow study of many aircraft configurations and parameters such as Mach number and aircraft's pitch angle to flight path.

Fujii is working now to improve the accuracy of his model. At present, the model is valuable for analytical purposes, but requires more resolution for design use. One key to achieving higher resolution results, Fujii believes, lies in using an even finer grid in the calculations than the fine-mesh grid distribution now in use. However, a finer grid requires costly additional computer time and enormous computer memory, larger than that of existing supercomputers.

A solution is to use a zonal method, which increases the number of grid points in selected areas, while keeping computer processing time from increasing. Using this technique, Fujii plans to extend the model to complex geometries which would include the fuselage as well as wing surfaces.

To obtain the necessary numerical solutions for the simulation, both a powerful computer and an efficient computational method were needed. Dr. Fujii's computation of vortical flows over a strake-delta wing were carried out on two supercomputers, the Cray-2 at the Ames Research Center Numerical Aerodynamics Simulation Facility and the Amdahl 1200 at the Amdahl Corporation.

To understand the flow inside the vortex breakdown, two dynamical graphics packages, developed at Ames, were used extensively -- Remote Interactive Processing (RIP) and Graphics Animation System packages. The RIP package showed the way in which the flow is directed inside the vortical flow region. The size and location of the breakdown were better understood with graphics animation. The use of both a graphics workstation and the dynamic graphics software was very important in enhancing the understanding of the computed flow fields.

February 1, 1988

NASA News

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Ames Research Center
Moffett Field, California 94035
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C.J. Fenrick 415/694-5091

For Release:

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Release No. 88-06

HIGH HONOR TO AMES DIRECTOR

Dr. William F. Ballhaus, Jr., director of NASA's Ames Research Center, Mountain View, Calif., was elected February 24 as a member of the National Academy of Engineering.

Election to the Academy is one of the highest professional distinctions awarded to an engineer. Academy membership honors those who have made "(an) important contribution to engineering theory and practice, including significant contributions to the literature of engineering," or those who have demonstrated "unusual accomplishment in new and developing fields of technology."

Ballhaus was elected to the Academy for his ". . . imaginative development of computational fluid mechanics design methods for aircraft."

Robert M. White, President of the National Academy of Engineering, also announced the election of 84 other engineers to membership in the Academy and seven foreign associates, including one who was honored posthumously. This brings total U.S. membership to 1,417 and the number of foreign associates to 128.

# # #

February 29, 1988

NASA News

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C. J. Fenrick 415/694-5091

For Release:

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Release No. 88-07

QUAD S COMPANY SELECTED FOR NASA CONTRACT NEGOTIATION

NASA's Ames Research Center, Mountain View, Calif., has selected Quad S Company of Solano Beach, Calif., for final negotiations leading to award of a 5-year, cost-plus-award-fee contract with a proposed value of approximately $34.7 million.

Quad S Company will provide administrative support services to both the Ames Research Center and Dryden Flight Research Facility, Edwards, Calif. The contractor will perform tasks within logistics, technical information, external affairs, acquisition and human resources areas. The anticipated contract start date is April 15.

The contract is a consolidation of four existing contracts for these services. Proposals were received from 14 firms for this requirement.

# # #

February 29, 1988

NASA News
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For Release:

Diane Stanley 415/694-5091

Immediate

Release No. 88-08

AIRBORNE OBSERVATORY EMBARKS ON SOLAR ECLIPSE
EXPEDITION TO STUDY SUN'S MID-ATMOSPHERE

NASA's C-141 Gerard P. Kuiper Airborne Observatory will leave NASA Ames Research Center March 12 for Guam to study the sun's atmosphere during the total solar eclipse of March 17-18.

A team of seven scientists aboard the KAO will make a flight through the shadow of the moon as it moves across the Pacific Ocean. The scientists are interested in the few seconds at the beginning and end of the solar eclipse - when the sun is almost completely covered by the moon and when the edge of the solar disk begins to reappear from behind the moon. The Kuiper, with a team of twelve flight and telescope crewmembers, will intercept the eclipse's path about six hundred miles northwest of Guam.

By studying the solar atmosphere during the first and last stages of complete occultation, scientists hope to determine a "brightness profile" of the solar atmosphere. Brightness profiles provide the key for modeling the temperature and height distribution of the chromosphere, the middle part of the solar atmosphere. The structure and dynamics of the sun's chromosphere remain unclear and are fundamental areas of research in astrophysics.

- more -

The 36-inch reflector telescope aboard the Kuiper will make infrared measurements at the far-infrared wavelengths of 30, 50, 100, 200, 400, and 800 micrometers. This is the first attempt to simultaneously record these wavelengths from the sun on such a narrowly defined spatial scale. Special filters will be used to allow the telescope to be pointed at the sun.

The study of the sun presents opportunities and conditions unattainable in any laboratory situation. The sun is one of countless billions of main sequence stars and exhibits attributes common to them all. Phenomena similar to those occurring in the sun's atmosphere are also seen in very young stars and in older stars reaching the final stages of their life cycle. By studying our home star in detail we can further our understanding of stellar processes in general.

The principal investigator for this research is Dr. Eric E. Becklin of the Institute for Astronomy in Honolulu, Hawaii. Co-investigators are Drs. Chas. A. Lindsey and Frank Q. Orrall, also from the Institute of Astronomy; Drs. Michael W. Werner and Thomas L. Roellig of the Astrophysical Experiments Branch at NASA Ames Research Center; Mr. Greg Kopp of Stanford University; and Dr. John T. Jefferies of the National Optical Astronomy Observatories.

The Kuiper, a modified Lockheed C-141 jet transport aircraft, is fitted with a 36-inch diameter telescope and flies at 41-45,000 feet. This lifts it above 99 percent of the Earth's atmospheric water vapor which attenuates infrared signals.

Based at and operated by NASA Ames Research Center in Mountain View, California, the observatory is a national facility available to government, academic, and private research institutions. The KAO is used regularly for astronomical observations at infrared wavelengths to investigate the planets and study star formation and evolution.

March 4, 1988

NASA News

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Ames Research Center
Moffett Field, California 94035
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C. J. Fenrick 415/694-5091
Release No. 88-09

For Release:

Immediate

NORTHROP SERVICES, INC., SELECTED
FOR NASA CONTRACT NEGOTIATION

NASA's Ames Research Center, Mountain View, Calif., has selected Northrop Services, Inc., (NSI), of Sunnyvale, Calif., for final negotiations leading to award of a cost-plus-award-fee contract with a proposed value, including all options, of approximately $60 million.

NSI will provide support services for aircraft and flight simulator maintenance and technical support to the Ames Research Aircraft Operations Division. The contractor will provide maintenance and engineering support for research platform aircraft, including the King Air B200, Lear Jet Model 24, C-130 and DC-8-72; and engineering support for research aircraft, including the XV-15, YAV-8B, QSRA, YO-3A and the CH-47 aircraft.

The contractor also will provide maintenance and engineering support for flight simulators, including the six-degree-of-freedom motion simulator, the vertical acceleration and roll device, the vertical motion simulator and flight simulator for advanced aircraft.

The contract will be awarded as a 2-year base period of performance and a 3-year, priced option, with an anticipated start date of Oct. 1. In this competitive procurement, NSI was the only offeror for this new 5-year effort.

March 8, 1988

NASA News

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Ames Research Center
Dryden Flight Research Facility
P.O. Box 273
Edwards, California 93523
AC 805 258-8381

RELEASE NO. 88-9 FOR RELEASE: IMMEDIATE

Nancy Lovato
(805) 258-8381

VIEWING AREA AVAILABLE FOR SHUTTLE LANDING

The East Shore Viewing Site at Edwards Air Force Base, California, will be available for viewers wishing to observe the landing of the Space Shuttle Discovery, mission STS-26, now scheduled for approximately 7:55 a.m. PDT on October 3, 1988, according to officials at NASA's Ames-Dryden Flight Research Facility at Edwards.

Vehicle passes are not required for the East Shore Site. The viewing site officially opens at 8 a.m. the day prior to landing. Access to this site will be closed one hour prior to landing.

Normal access to Edwards Air Force Base will be restricted to official business only.

Viewers should follow news reports for any possible change in the landing date or location. Up-to-date landing information may be had by calling (805) 258-3520.

The East Shore Viewing Site offers an unobstructed view of the shuttle landing. Parking is on unprepared surfaces. Very limited water and personal conveniences will be furnished.

Access to the viewing site is via secondary roads, and there may be congestion. There are two access routes to the East Shore Viewing Site.

Those traveling from the Los Angeles area should go north on the Antelope Valley Freeway (Highway 14), turn right (east) on the Avenue F off-ramp, then left (north) on Sierra Highway to Avenue E, right (east) on Avenue E to 140th Street, then left (north) on 140th to Avenue B, turn right (east) and Avenue B curves into Mercury Boulevard, which leads into the viewing area.

Those entering from Highway 58 should take the Rocket Site Road off-ramp to Mercury Boulevard, which leads into the viewing area.

-NASA Ames-Dryden-

September 19, 1988

NASA News
National Aeronautics and
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Ames Research Center
Dryden Flight Research Facility
P.O. Box 273
Edwards, California 93523
AC 805 258-8381

RELEASE NO. 88-10

FOR RELEASE: IMMEDIATE
(ALSO RELEASED BY
NASA HEADQUARTERS,
WASHINGTON, D.C.)

Lisa Fowler
Kennedy Space Center, Fla.
(Phone: 407/867-2468)

Nancy Lovato
Ames-Dryden Flight Research Facility, Edwards, Calif.
(Phone: 805/258-8381)

EDITORS NOTE: STS-27 NEWS MEDIA ACCREDITATION

NASA is accepting accreditation requests from news media representatives wishing to cover the Space Shuttle Atlantis mission (STS-27) currently targeted for launch in late November.

News organizations planning to send representatives to cover STS-27 must send a letter requesting accreditation for the mission. STS-26 credentials do not apply to subsequent missions, thus new requests must be submitted.

Requests for credentials, launch through landing, should be submitted to:

NASA John F. Kennedy Space Center
PA-PIB/Accreditation
Kennedy Space Center, FL 32899

Please indicate from which NASA location(s) you plan to cover the mission. Media planning to cover the landing only should submit their requests for accreditation to:

NASA Ames-Dryden Flight Research Facility
Attn: DXI/Public Affairs
P.O. Box 273
Edwards, CA 93523

-more-

Requests for accreditation must be made by a supervisory official, other than the applicant, on company letterhead, clearly indicating the assignment (reporter, photographer, technician, etc.) and social security number of each individual. Freelance writers and photographers must offer proof of assignment or evidence of past professional activity. The accreditation will be valid for all NASA news centers.

The news center will open at Kennedy Space Center 5 days prior to launch; at Johnson Space Center, Houston, 3 days prior to launch; and at Ames-Dryden Flight Research Facility, 1 day prior to launch.

NASA ground rules for newspersons covering the mission are:

- NASA will not make travel or housing arrangements.
- Only working newspersons will be accredited at the news centers. Publishers and other news and advertising executives will not be accredited. These individuals should apply to NASA Public Services Division (LP), NASA Headquarters, Washington, D.C., 20546.
- Friends, dependents or relatives not covering the mission will not be accommodated.
- No one under 16 years of age will be allowed at the press site under any circumstances.
- Philatelic publications must meet the criteria of general publications or be national publications of recognized philatelic organizations. Representatives of catalogs, newsletters, local clubs or profit seeking projects will not be accredited. Conducting philatelic business, other than reporting, is not permitted.
- College news media are limited to two accredited correspondents per college.
- Media representatives must present their letter of acceptance and a photo identification to obtain a news badge at the appropriate center.
- Violations of the rules will result in loss of press badge and press site privileges.

-end-

October 31, 1988

NASA News

National Aeronautics and
Space Administration

Ames Research Center
Dryden Flight Research Facility
P.O. Box 273
Edwards, California 93523
AC 805 258-8381

RELEASE NO. 88-11 FOR RELEASE: IMMEDIATE

Nancy Lovato
(805) 258-8381

VIEWING AREA NOT AVAILABLE FOR SHUTTLE LANDING

Space Shuttle Mission STS-27 is now scheduled for launch on December 1, 1988. Landing is planned for Edwards Air Force Base, California, however, since the flight is a classified Department of Defense mission no viewing site will be available.

Access to Edwards Air Force Base will be restricted to official business only during landing operations. There will be no guest access nor will usual NASA tours be held during that period.

The STS-27 landing date and time will not be announced until 24 hours prior to landing.

NASA officials expect the East Shore Viewing Site to be open for the following Space Shuttle mission, STS-29, now scheduled for an Edwards landing in late February 1989.

-NASA Ames-Dryden-

November 22, 1988

NASA News

National Aeronautics and
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Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

C.J. Fenrick 415/694-5091

For Release:

Immediate

Release No. 88-14

NASA SCIENTISTS FIND CONFIRMATION
OF STELLAR EVOLUTION THEORY

An important confirmation of the theory of how stars evolve has been made by new measurements of the nitrogen-to-oxygen ratio in interstellar gas. Stellar evolution theory describes the development of all stars -- including our star, the Sun. Until now less nitrogen relative to oxygen had been found in young gas clouds, called nebulae, than in the Sun.

The research of NASA scientists Drs. Robert Rubin, Janet Simpson, Michael Haas, and Edwin Erickson points out that the prior underestimates of the nebular nitrogen-to-oxygen ratio were all made using observations in the optical spectral region. Rubin and his associates made observations in the far infrared spectral region.

Synthesis of elements heavier than hydrogen and helium occurs in stars. These heavy elements are manufactured by nuclear reactions deep in cores of stars and released by various methods in stellar old age.

Atoms of the oxygen we breathe, the carbon in our cells, and the calcium in our bones, all were manufactured by previous generations of stars. Because our star, the Sun, formed about 4.5 billion years ago from gas clouds representing the mix of stellar elements existing then, we see "fossilized" abundances from that time when analyzing the light from the Sun today.

- more -

Therefore, it would be reasonable to expect present day clouds of interstellar gas to have higher abundances of the heavy elements (heavier than hydrogen and helium) compared to our Sun because of an additional 4.5 billion years of enrichment by dying stars expelling more heavy material back into the interstellar medium.

An important prediction of stellar evolution theory is that the nitrogen/oxygen ratio should increase with time. For this reason, scientists have been puzzled as to why the nitrogen-to-oxygen ratio observed in gaseous nebulae younger than the Sun have smaller than the solar value.

Recent observations made with the Kuiper Airborne Observatory, a specially equipped C-141 aircraft, based at NASA's Ames Research Center near Mountain View, Calif., have revealed a much higher nitrogen-to-oxygen value for the young gas clouds. An average nitrogen-to-oxygen value for these nebulae is twice the solar value of 0.12.

The new observations were made in the far infrared spectral region, where astronomical objects cannot be detected from even the highest mountain observatories because of radiation absorption by the Earth's atmosphere. However, when flying at an altitude of over eight miles, this radiation can be detected. These NASA scientists point out that prior underestimates of the nebular nitrogen-to-oxygen ratio were all made using observations in the optical spectral region. The observations were not wrong, but their interpretation is subject to large errors, while the interpretation of the far infrared data is much clearer. The NASA group enumerate other inherent advantages of the far infrared observations including the ability to probe nebulae closer to the center of our galaxy, since the infrared penetrates the dusty clouds in the plane of the Milky Way while the optical radiation is severely blocked.

Foretelling whether the Sun remains shining at nearly constant energy output for another 4-5 billion years or explodes next month, for example, depends on the reliability of this theory. Fortunately, the theory predicts the former.

April 22, 1988

NASA News

National Aeronautics and
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Ames Research Center
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AC 415 694-5091

For Release:

Peter Waller 415/694-5091
Linda Blum

Immediate

Release No. 88-16

PERSPECTIVE DISPLAY SYSTEM
DEVELOPED FOR SPACECRAFT MANEUVERS

A computer-generated display system, to aid close-in spacecraft maneuvers, has been developed at NASA's Ames Research Center, Mountain View, Calif. The display can precisely depict a spacecraft's position relative to other vehicles and objects, allowing rapid, accurate monitoring and response.

Developed by Stephen R. Ellis and colleagues at Ames, the system can be placed aboard spacecraft such as the planned U.S. Space Station. It would help in conducting and monitoring maneuvers within 1 mile of the Space Station. These "proximity operations" include docking and berthing orbital vehicles and rendezvous between two or more vehicles.

The display uses modified geometric perspective to convey three-dimensional information on a computer screen. Earlier display designs used two-dimensional grids with numerical data tags to convey depth. Tests at Ames indicate that the perspective display can be more easily and accurately interpreted because it provides users with pictures rather than words and numbers.

- more -

The perspective display also may be useful in a number of areas which require the representation of three-dimensional forms on computer screens and other two-dimensional surfaces. Potential applications include medical illustration, molecular biology, seismography, architecture and cartography.

For space applications, the perspective display, like earlier display designs, will function by generating computer graphics based on data from a sensor using radar or lasers to track the position of other vehicles.

An "electronic eye" is needed aboard spacecraft to augment human vision because, at distances of hundreds of feet, other objects, even large spacecraft, can appear too small to be seen by the unaided eye. Also, looking directly toward the Sun, which from space is not shielded by Earth's atmosphere, can be dangerous to the human eye.

The computer-aided display will permit tracking of two or more vehicles which may be widely separated in space. This will become increasingly important as space traffic increases. While much of the proximity operations will be automated, humans will need to monitor the system, correct errors and make decisions.

Simulation experiments conducted at Ames suggest that the perspective display, when used in an aviation environment, produces superior maneuvering performance compared to ordinary two-dimensional formats. In tests using the perspective display, pilots and other subjects responded more quickly to approaching spacecraft. Subjects also tended to make vertical maneuvers more frequently, overcoming a horizontal maneuver bias created by two-dimensional formats.

The perspective display design is based on research into how people mentally reconstruct three dimensions from two dimensional images. In a series of studies, the Ames researchers found that at "correct" perspective, peripheral objects may appear to be further off to the right and left than they really are. In normal vision, spatial position appears flattened for distant objects so that objects both above and beneath a given point appear to be at the same level. The perspective display system has been designed to compensate for these tendencies.

"It's relatively simple to make an image that appears three-dimensional. The difficulty is in creating an image users will interpret correctly," Ellis says. "To accurately depict spatial position on a flat surface, you have to take into account not only the spatial dimensions involved, but also human perceptual capabilities. It is sometimes necessary to lie a little to achieve effective communication. We provide truth through appropriate distortion."

The perspective display also modifies "true perspective" by adjusting the size of objects within range so that these will always remain visible, never disappearing into tiny dots. The system includes a special zoom capability for close-in maneuvering, which is designed so that when the screen is magnified, the total range remains the same and objects at the edge always remain visible.

Spatial awareness is assisted by symbols indicating how far away other spacecraft are with respect to a given spacecraft. With tic marks indicating separation and diagonal lines indicating orientation, vertical reference lines extend from each spacecraft. Grid lines form a moving frame of reference which "flies with the spacecraft," turning as the ship turns.

Recent work on the perspective display allows computer graphics systems to simulate planned spacecraft maneuvers, allowing pilots to visualize the consequences of a variety of orbital changes. "Up to now, spacecraft maneuvers, even close-in rendezvous, have been very formal, requiring elaborate planning. We're developing a system that lets you conduct orbital change maneuvers on an informal, short-term basis," Ellis said.

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The perspective display is now in use at Ames in a full-scale research mock-up of a proximity operations control center for the Space Station. The mock-up includes a number of test technologies including a heads-up (through the window) display, voice-actuated controls and an advanced window design. The research will help in designing the proximity operations control center for the Space Station. It also will help in understanding what physical layout and control instruments would be optimal, to what degree operations should be automated and what crew skills will be needed.

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March 31, 1988

NASA News

National Aeronautics and
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Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

For Release:

Peter W. Waller 415/694-5091

April 1, 1988

Release No. 88-17

NASA AWARDS CONTRACT TO ETA SYSTEMS, INC.

NASA's Ames Research Center, Mountain View, Calif., has awarded ETA Systems, Inc., St. Paul, Minn., a firm-fixed price contract for acquisition of an Initial Computer System with an option for a High Speed Processor 2 (HSP-2) Computer System for use in the Numerical Aerodynamic Simulation Processing Network.

The acquisition consists of leasing the Initial System for one 12-month period (Phase 1): the option to lease the HSP-2 system, which will replace the Initial System, for one 36-month period (Phase 2) and additional fixed-price hardware upgrade options.

The contract, scheduled to begin April 10, 1988, has a total value of $40,479,968, consisting of $7,299,532 for Phase 1, $27,962,036 for Phase 2 and $5,218,400 for the hardware upgrade options.

The Initial System will be capable of performance exceeding 250 million floating-point operations per second in sustained computation with at least 500 million bytes of common memory and at least 25 million bytes of high-speed mass storage. The HSP-2 system will be capable of performance exceeding 1 billion floating-point operations per second in sustained computation with at least 2 billion bytes of common memory and at least 50 billion bytes of high-speed mass storage.

The work will be performed at NASA's Ames Research Center.

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For Release:

Peter W. Waller 415/964-5091

Immediate

Release: 88-31

STUDY GROUP ISSUES REPORT ON SPACE STATION RESEARCH OPPORTUNITIES

A group of scientists and researchers has submitted its final report to NASA, concluding that "full implementation of a 'quick is beautiful' philosophy into NASA's operational thinking" about Space Station utilization "would be an important step in revitalizing this nation's space research effort."

Chaired by Dr. David C. Black, chief scientist for space research at NASA's Ames Research Center, Mountain View, Calif., the study group examined ways the Space Station could be used to conduct small-to-moderate size space experiments that could be developed quickly and inexpensively and which, in some cases, need relatively rapid initial deployment and/or reflight.

Consisting of individuals from NASA, industry, the National Science Foundation and the National Institutes of Health, the study group recently presented its conclusions and recommendations to NASA's Office of Space Station.

"The group has done an outstanding job in studying ways to use the Space Station to make space more accessible to researchers from our university and corporate laboratories, something which is of critical importance to this nation's future in space," said James Odom, associate administrator for the Space Station. "We will do our utmost to see that the group's recommendations are implemented."

Copies of the report are available in the NASA Headquarters Newsroom and the Space Station Public Affairs Office.

5-16-88

NASA News

National Aeronautics and
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Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

Peter W. Waller 415/694-5091
Hilliard Gastfriend

For Release:

10:00 a.m. PDT
Monday, June 13, 1988

Release No. 88-36

PIONEER 10 IS NOW FOUR BILLION MILES FROM THE SUN;
LEFT SOLAR SYSTEM FIVE YEARS AGO

Pioneer 10, the first spacecraft to leave our solar system, is now just over four billion miles away -- the most distant human-made object in existence. The spacecraft continues to make discoveries about the edges of the Sun's atmosphere. It seeks the boundary between the solar atmosphere and the true interstellar gas. It continues to search for very long wavelength (billions of miles) gravity waves, and for data on a tenth planet.

On June 13, 1988, Pioneer 10 will have spent five years beyond all the planets. On that date, it will be 4,175,500,000 miles from the Sun, almost 45 times the distance from the Earth to the Sun. Radio signals, moving at the speed of light, now take 12 hours and 26 minutes to travel from Earth to spacecraft and back, the longest time of any radio communication in history.

Pioneer 10 is managed by NASA's Ames Research Center, Mountain View, Calif., and was built in 1972 by TRW, Inc., Redondo Beach, Calif. It is one of the space program's most successful missions. It was the first spacecraft to cross the Asteroid Belt, fly by Jupiter and return pictures, chart Jupiter's intense radiation belts, measure the mass of its four planet-sized moons, locate the giant planet's magnetic field, and discover that Jupiter is predominantly a liquid planet.

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The spacecraft, launched in 1972, continues to operate extremely well as it collects and transmits data back to Earth. Its primary mission, originally scheduled for 21 months, was to assess the feasibility of passage through the Asteroid Belt and provide the first close-up examination of Jupiter and its moons. Pioneer 10 accomplished all of its original goals by December 1973. At that point, the mission was indefinitely extended. Scientists reprogrammed the probe to explore the Sun's atmosphere and to look for a tenth planet and gravity waves in the far outer solar system and beyond.

Perhaps the most important finding about the outer solar system concerns the heliosphere, the Sun's atmosphere. Pioneer 10 continues to measure the "solar wind," the million-mile-per-hour flow of charged atomic particles boiling off the Sun's surface which forms the Sun's tenuous atmosphere.

Scientists had predicted that the solar wind would not extend beyond Jupiter's orbit, but their estimates were proved wrong. The probe is now six times that distance, and has not yet reached the boundary of the solar atmosphere, and the Sun's direct influence continues to be strong. A number of scientists believe that this boundary may be as far away as 9.3 billion miles, almost five times the distance from Pluto to the Sun.

Several scientists, including Dr. James Van Allen, Pioneer principle investigator and discoverer of the Earth's radiation belts, and Dr. Darrell Judge, University of Southern California, also a Pioneer investigator, suggest that the heliosphere varies in size with solar activity and is nearly spherical in shape. Because of this, they think Pioneer 10 may break through the boundary of the solar atmosphere and pass into interstellar space in the next one to three years. There the spacecraft could directly measure the interstellar gas. Data on this space between the stars is impossible to obtain from Earth.

Pioneer 10 has found that the Sun strongly influences the solar atmosphere even as far away as four billion miles. NASA scientists are finding major variations in the solar wind keyed to the Sun's 11 year cycle.

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The Sun changes a great deal during this cycle. The number of sunspots -- the enormous and violent magnetic storms on the solar surface -- varies radically, as does the shape of the Sun's magnetic field, and movements in the hot gases surrounding the corona, the flaring outer portion of the Sun. The coronal material has sparse areas called "coronal holes" located around the Sun's two magnetic poles. When the Sun approaches its most active phase, solar maximum, these coronal holes creep toward the equator by extending "tongues" 10 or 20 degrees wide in longitude. During the solar minimum, the holes retreat back to the poles.

Pioneer 10 and other closer in spacecraft are measuring "high speed streams" in the solar wind pegged to the movement of the coronal holes. It found that other changes are triggered by movements of a vast electromagnetic structure called the current sheet, which bisects the Sun's field. Particles slow down as this sheet "flaps" toward them.

Pioneer has also made new findings on cosmic rays entering our portion of the Milky Way. Cosmic rays are high velocity sub-atomic particles often originating outside our galaxy. Normally the number of these particles varies with the solar cycle, and large amounts of low energy cosmic rays were found during the recent low point of activity on the Sun. This may suggest that Pioneer is approaching the heliosphere boundary where the solar atmosphere stops. There, the layer of solar atmosphere beyond the spacecraft which deflects cosmic ray particles away from the solar system would be much thinner.

The possible existence of a tenth planet at the outer fringes of the solar system may result from measuring minute changes in Pioneer 10's flight path. Astronomers have suggested the presence of a new planetary body since Pluto was found in 1978 to be too small to explain past irregularities in the orbits of Uranus and Neptune.

Pioneer 10 and its twin, Pioneer 11, are excellent indicators of the gravitational pull of celestial objects. Because they are spin stabilized, they generate almost no forces of their own which would affect their straight-line path. Thus, large, nearby masses exerting gravitational forces should easily be observed by changes in Pioneer 10's trajectory, but NASA scientist John Anderson has found absolutely no evidence of any uncharted planetary bodies.

Despite this lack of evidence, Anderson and others believe strongly that the huge volume of past measurements, made by many eminent observers, showing irregularities in the orbits of Uranus and Neptune are too widespread and consistent to be discarded. They suggest that whatever perturbed the outer planets between 1800 and 1900 has now "gone away." It could well be an object whose orbit is tilted at a high angle to the plane of the solar system. These gravitational anomalies are no longer observed because the object is currently too far away or too high above the planets to affect either Pioneer or the outer planets. Anderson and other researchers have suggested places to look for this planet-sized body, and a number of groups are searching these regions of space.

Tracking Pioneer 10 also provides scientists with an opportunity for detecting "gravity waves," predicted by Einstein's Theory of Relativity. In theory, infrequent and enormously powerful cataclysmic events such as collisions between entire galaxies or two massive black holes would "rattle" the entire universe, producing gravity waves. A number of university research groups around the world have been using elaborate equipment to find gravity waves for well over a decade. None have been found.

Gravity waves may be especially easy to detect in the extremely long wavelengths (one to four billion miles) that both Pioneers are in position to measure, but neither Pioneer has yet found any. Gravity waves would dwarf the longest radio waves, the largest waves commonly measured on Earth, which span only hundreds or thousands of feet.

Recent improvements in the NASA ground stations are expected to allow communications with Pioneer 10 to continue until the range approaches six billion miles, more than twice the pre-launch estimates.

Project manager Richard O. Fimmel expects that NASA will be able to track Pioneer 10 until the craft's power source limits communications toward the end of the 1990's.

Both Pioneer 10 and 11 carry an easily-interpreted graphic message in the event that it may encounter any intelligent life forms on its journey. Engraved on a gold-anodized aluminum plaque, the message features a drawing of a man and a woman, a diagram of our solar system, and a map depicting our solar system with reference to some galactic "lighthouses," known as pulsars.

Scientists believe that both Pioneer 10 and 11 will travel among the stars virtually forever because the vacuum of interstellar space is so empty. Most damage occurs due to the solar wind and micrometeoroid impacts, and the Pioneer has long passed the region of greatest potential danger.

NASA News

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Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

Peter W. Waller 415/694-5091
Hilliard Gastfriend

For Release:

Immediate

Release No. 88-37

NOTE TO EDITORS:

Pioneer 10, the first spacecraft to leave our solar system, is now just over four billion miles away -- the most distant human-made object in existence. The spacecraft continues to make new discoveries about the edges of the Sun's atmosphere, and may soon enter the true interstellar gas. It also searches for Einstein's "gravity waves," and data on a tenth planet.

On June 13, 1988, Pioneer will have spent five years beyond all the planets. It will be 4,175,500,000 miles from the Sun, almost 45 times the distance from Earth to Sun. Radio signals at the speed of light now take 12 hours and 26 minutes to travel from Earth to spacecraft and back, the longest time of any radio communication in history.

Pioneer's recent accomplishments will be outlined at a news briefing at NASA's Ames Research Center at 10:00 a.m. Monday, June 13. Participants will include Pioneer investigators Drs. James Van Allen, Darrell Judge, and John Anderson; plus Richard O. Fimmel, Ames project manager; and Dr. Palmer Dyal, project scientist.

Media representatives are invited to a ceremony and social event in the Pioneer Mission Operations Center celebrating Pioneer's record longevity and recent accomplishments. This will take place at 12:00 noon. Pioneer and Ames officials, scientists,

- more -

mission controllers, and other notables will take part. The four-billion-mile spacecraft signal will be "piped-in" in audio and visual form. Other Pioneer artifacts are there.

Various print material, videotape, audio tape, and photographs will be available. These include the Pioneer plaque, the message to extraterrestrials, attached to the spacecraft.

Pioneer's anniversary will also be marked in Los Angeles with a ceremony at the California Museum of Science and Industry. Pioneer's radio signal will be piped into the museum. TRW, Inc., spacecraft builder, will also participate and have events.

Media representatives planning to attend the briefing at Ames should come to the Ames Visitor Reception Center, and will be directed from there.

6/3/88

NASA News

National Aeronautics and
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Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

Peter W. Waller 415/694-5091
Hilliard Gastfriend

For Release:
Immediate

Release No. 88-38

Note to Television and News Editors:

PIONEER BRIEFING ON NASA SELECT TV

Pioneer 10, the first spacecraft to leave our solar system, is now just over four billion miles away -- the most distant human-made object in existence. The spacecraft continues to make new discoveries about the edges of the Sun's atmosphere, and may soon enter the true interstellar gas. It also searches for Einstein's "gravity waves" and data on a tenth planet.

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The briefing will be available on NASA Select television and questions will be taken from news reporters at participating NASA centers. The briefing will be carried live for news organizations, on NASA Select television, (Satcom F2R, transponder 13, Frequency 3960 MHz, audio 6.8 MHz, 72 degrees west longitude). If feasible, the Pioneer ceremony will also be telecast on NASA Select on a tape-delayed basis at about 1:00 p.m. PDT.

Pioneer's anniversary will also be marked in Los Angeles with a ceremony at the California Museum of Science and Industry. The NASA Select coverage will be available at the Museum. TRW, Inc., spacecraft builder, will also participate and have events.

6/7/88

NASA News

National Aeronautics and
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Moffett Field, California 94035
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For Release:

Diane Stanley 415/694-5091 IMMEDIATE

Release No. 88-40

ATMOSPHERE OBSERVED ON PLUTO

The first direct observation of an atmosphere on Pluto has been made by Massachusetts Institute of Technology astronomers flying aboard NASA Ames Research Center's Kuiper Airborne Observatory.

A team of astronomers from MIT including Edward Dunham, James Elliot, Amanda Bosh, Steve Slivan, and Leslie Young made the observation on June 9 during a temporary disappearance, or occultation, of a star behind Pluto.

Pluto is the ninth planet from the Sun, more than 2.5 billion miles from Earth and smaller than the Moon. The planet's discovery in 1930 by Tombaugh was based on mathematical predictions of Lowell who observed unexplained motions in Uranus' and Neptune's orbit. Charon, its only satellite, measures at least half the diameter of Pluto and was first observed in 1978 by James Christy. Pluto is the only planet in the solar system with a moon so near its own size.

The expedition was carried out by the Ames Kuiper Airborne Observatory project team, headed by Carl Gillespie, expedition manager. The observations were made at 41,000 feet (12,300 meters) altitude, approximately 500 miles south of Pago Pago, American Samoa, over the Southern Pacific Ocean.

Information about the temperature, pressure, and extent of the atmosphere will be derived from the occultation data. Principal Investigator Dr. James Elliot, of MIT's Earth, Atmospheric, and Planetary Sciences Department, and his associates observed Pluto's atmosphere using a solid state video camera attached to the Kuiper's 36 inch (92 cm) telescope.

Elliot's team observed the occultation of a faint twelfth magnitude star by Pluto to study the possible atmosphere by recording changes in the light intensity of the star as it appeared to pass near and then behind the planet. The visible light signal from the star gradually declined as it approached Pluto's disk. Using the same technique, Elliot discovered the rings of Uranus aboard the Kuiper in 1977, while observing a Uranus stellar occultation with the same telescope.

The Pluto occultation was visible only in the Southern Pacific Ocean. Pluto's circular "shadow" fell across the Earth in a path 1200 nautical miles wide. The Kuiper's flight through Pluto's shadow may allow a more precise measurement of the planet's diameter to be made when combined with ground-based observational data. Observations of the occultation were also made by Robert Millis of Lowell Observatory in Flagstaff, Arizona, from a ground site in northeastern Australia.

The airborne observations lasted about 1.5 minutes, occurring shortly after midnight on June 9. The KAO left Hickam AFB in Honolulu, Hawaii, at 7:30 p.m. local time and arrived in Pago Pago, American Samoa, at 2:00 a.m. local time.

Pluto's erratic wobbling made the exact location of the shadow difficult to predict. Pluto's position was observed for several weeks prior to the flight. Larry Wasserman of Lowell Observatory calculated the track of Pluto's shadow from measurements of astrometric plates obtained at the U.S. Naval Observatory base in Flagstaff, Arizona.

The Kuiper Airborne Observatory is a national facility operated by NASA for observations of astronomical events, planets, galaxies, and interstellar gas and dust clouds. In the past two years the Kuiper has made extensive observations of Comet Halley and Supernova 1987A.

The mobility of the Kuiper allows astronomical observations to be made from remote locations around the world and above most of Earth's cloud cover. The Kuiper Airborne Observatory is managed by NASA Ames Research Center in Mountain View, California.

-end-

June 10, 1988

NASA News

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AC 415 694-5091

Peter Waller 415/694-5091
Linda Blum

For Release:
10:00 a.m. PDT, July 12, 1988

Release No. 88-49

NASA COMPUTER MODEL TO ADVANCE JET ENGINE DESIGN

A new computer model takes a major step toward accurately simulating the complex, fluctuating air flow within aircraft engine turbines and compressors. The model is expected to lead to substantial advances in jet engine design, eventually producing smaller, more efficient, reliable and longer-lived engines.

The new computer model, developed by Man Mohan Rai of NASA's Ames Research Center, Mountain View, Calif., should generate significant savings for the aircraft engine industry when ready for commercial applications in 3 to 5 years.

The NASA model allows analysis of rotor-stator air flows, which form the heart of most turbines and compressors within aircraft engines. The most accurate calculation to date of air flow within turbines, the model provides precise analysis of interior changes in pressure, temperature and velocity. Flow is tracked in the three spatial dimensions over time.

The model performs one of the most complex computer simulations ever done, involving more than 22 trillion computations. It can be applied to a wide variety of jet engines. With some adaptation, it also may be used with other rotating machinery, such as prop fans and helicopter rotors.

Now valuable as an analytical tool, the model's computer run time must be reduced to make it practicable for design optimization. The model now requires 100 hours on an advanced supercomputer.

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Within 6 months to a year, researchers expect to reduce the run time to 20 hours, at which point the model will become useful in some design areas. The model's run time should be reduced to 1 to 10 hours within 3 to 5 years. This will depend on the speeds attained by supercomputers as well as further development of Rai's model. The model then will have broad commercial applications.

Previous computer models calculating air flow have involved major approximations. Some models do not include three-dimensionality or do not calculate unsteady air flow. Others use simplified geometries.

"This work is significantly more complete than these previous simulations," said Terry Holst, chief of the Ames Applied Computational Fluids Branch. "It's extremely difficult to do unsteady three-dimensional Navier-Stokes equations. To do this for complex geometries, as Rai has, is extraordinary. It's a tremendous achievement on the part of Man Rai."

The NASA model's geometry is detailed enough to account for the narrow clearance between the rotors and the outer casing of a turbine hub. "We almost give you reality. There's so much information, the problem is where to look," Rai said.

Calculating air flow within turbines and compressors is difficult because the flow continually fluctuates within these components due to the relative motion of some parts with respect to other parts. Gusts of wind outside an aircraft or other changes in the pressure of air entering the engine also can cause unsteady flow.

This unsteady flow creates fluctuating pressures on engine parts, resulting in thermal and mechanical fatigue which can drastically reduce the lifetime of parts. The NASA model can predict where these stresses will occur, so that engines can be designed to minimize flow-induced stresses, or components under stress can be made stronger.

Turbine efficiencies are lowered due to friction drag produced by the motion of fluids over the turbine blades. In addition, vortices (areas of swirling, low-pressure flow) block air going through channels and require more sophisticated flow field analysis. The NASA model predicts the size, strength and location of vortices. Calculating vortex formation and frictional drag will ultimately help in designing more efficient turbines.

Within an engine, air flows interact around closely-positioned moving parts, creating a complex, unsteady flow field. Generally, the closer the parts are, the more severe the fluctuations become. The NASA model provides understanding of interaction effects, so that parts can be placed closer together. Thus engines can be made smaller and lighter, saving valuable space and fuel.

Until now, engine concepts and designs have been tested primarily by experimental methods, most often by building prototype engines and subjecting them to a battery of tests. With these methods, studying a large number of configurations is extremely costly and time consuming.

Advanced computer techniques will be far less expensive and much faster. When the NASA model has been optimized it will be capable of providing answers for a given design within a few days. The computer model also can be used to study highly complex designs that cannot be fully tested experimentally.

Rai developed a new computational technique to represent the interactions of two bodies. Usually, in computational fluid dynamics, the region of interest surrounding a body, such as an aircraft, is filled with grid points at which temperature, pressure and velocity are calculated.

However, multiple moving bodies can be better described by multiple grids, and information must be transmitted between these grids. Rai has developed a highly accurate method for information transfer between grids. This technology now is being used in complex areas such as rotor-fuselage analysis.

The computer model uses advanced, high-speed computer graphics to visualize the flow calculations. With such tremendous amounts of data, analyzing the numerical results becomes an almost impossible task, Rai said. A single simulation by the NASA model may provide 2 billion data points.

Extremely powerful flow visualization capabilities help researchers understand the results. Rai and Paul Kelaita of Sterling Software structured the data so that it could be displayed visually, a complex task due to the great quantity of data.

Rai began the project in 1984 by developing a two-dimensional multiple-grid program for unsteady flow. The two-dimensional model now is being widely used for research and design. Future work will focus on developing programs for multiple rotor-stator configurations.

The initial computational work was done on Cray Research's high-speed Cray-XMP supercomputer. Rai now is using the powerful Cray-2 supercomputer, part of the new Numerical Aerodynamics Simulation supercomputer facility at Ames. Graphics were generated on a silicon graphics IRIS workstation.

Much of the future work on multiple engine stages awaits the development of faster and larger supercomputers. "Rai's work is pushing the state-of-the-art in supercomputing," Holst said. "There's so much information, it's difficult to store it all."

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Moffett Field, California 94035
AC 415 694-5091

Peter W. Waller 415/694-5091

For Release:

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Release No. 88-50

TO EDITORS: NASA Computer Model to Advance Jet Design

NASA scientists have succeeded in accurately reproducing by supercomputer the air flow within jet engine turbines and compressors. The work is tone of the most complex computer simulations ever done, involving 22 trillion computations. It promises major advances in aircraft jet engine design -- smaller, more efficient, reliable, and longer-lived engines.

In a period of serious U.S. trade imbalances, rapid progress in a major export item like jet engines is highly significant.

A news briefing to describe this research will be held at NASA's Ames Research Center on Tuesday, July 12, at 10:00 a.m. Dr. Man Mohan Rai, NASA-Ames senior scientist, will describe his work, which analyzes rotor-stator flow, the heart of most turbines and compressors of all types.

The briefing will be available on NASA Select television and questions will be taken from news reporters at participating NASA centers. The briefing will be carried live on NASA Select television, (Satcom F2R, transponder 13, Frequency 3960 MHz, audio 6.8 MHz, 72 degrees west longitude).

News media representatives planning to attend the briefing should come to the Ames Visitor Reception Center at Moffett Field. Videotape showing jet engine operations and just how the flow takes place inside them will be available, as will still photographs.

7/5/88

NASA News

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Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

Peter W. Waller 415/694-5091
Faye Flam

For Release:

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Release No. 88-52

PIONEER DATA REVEALS NATURE OF THE OUTER HELIOSPHERE

As NASA's Pioneer 11 and Voyager 2 pass through the outer reaches of the solar system and NASA's Pioneer 10 speeds far beyond the planets, these distant spacecraft are measuring drastic changes in the flow patterns of the solar wind -- a million mile-an-hour-stream of charged particles which constantly boils off the Sun.

NASA scientists have discovered a connection between the speed changes in the solar wind at these distant spacecraft and periodic changes in the Sun itself. The Sun's constant variations are manifested in shifts of the Sun's magnetic field and movements in the hot gases of the Sun's corona. Streams of faster wind particles tend to flow from thin areas in the corona.

The faster winds migrate along with these areas, called "coronal holes." Solar wind changes also are triggered by movements of a vast electromagnetic structure called the current sheet, which bisects the Sun's field. Particles slow down as this sheet "flaps" toward them. Over the last 3 years, the Sun has been going through a phase called solar minimum -- a turning point in its 11-year cycle. "No one knew what happened during solar minimum in the farthest reaches of the solar system and beyond until the Pioneers and Voyager sent back their measurements. This is the first solar minimum for which we have been able to see what's going on in the solar wind out past Pluto," says NASA astrophysicist John Mihalov.

- more -

The solar wind streams out from the Sun and envelops the entire solar system in charged particles, mostly electrons and protons. No one knows exactly how far this five particle per cubic centimeter flow of particles extends. One recent guess is about 18 billion miles, or four times the distance of Neptune from the Sun.

Before 1985, Pioneer 10 and Voyager 2, both positioned near the equatorial plane, measured periodic gusts in the solar wind called "high speed streams." The particles would speed up and then slow down about once every 27 days. Around June 1985, the wind stream pattern stopped and the winds slowed down dramatically at the closer Voyager 2 -- two billion miles from the Sun. But there was no slowing measured at Pioneer 11 -- about the same as Voyager 2 distance but 15 degrees higher in latitude. Pioneer 11 measured the usual pattern of high speed streams. Eventually, the winds were flowing only about half as fast at Voyager 2 as they were at Pioneer 11.

Three months later, in August, the solar wind slowed and the high speed streams also stopped at Pioneer 10, which is out twice the distance of the other two probes and in the equatorial region. Mihalov believes this change is connected to the earlier wind speed decrease at Voyager 2. The first slower particles which were blowing past Voyager 2 in June would have just reached Pioneer 10 by August. Meanwhile, solar winds actually sped up at the higher altitude position of Pioneer 11.

Back at the Sun, the slower particles that first reached Voyager and Pioneer 10 were boiling off in March of 1985. Mihalov and Aaron Barnes, Ames senior scientist, proposed that changes in the Sun at this time set off the changes out in the far solar wind which reached the vicinity of the distant probes months later.

The changes in the Sun were a part of a regular variation that the Sun undergoes in 11-year cycles or "sunspot cycles." This cycle affects the number of sunspots, the configuration of the magnetic field, and the distribution of the two million degree gas making up the solar corona.

The coronal material has sparse areas called "coronal holes" located around the Sun's North and South poles. When the Sun approaches the part of its most active phase, called solar maximum, these coronal holes creep toward the equator by extending "tongues" 10 or 20 degrees in longitude. In the last 3 years, the Sun has been near the opposite condition, called solar minimum, when the holes retreat back toward the direction of the poles.

The wind blows out the fastest from these lower density holes. Barnes explains that the holes form in areas where strong winds have blown the coronal particles away. As the holes retreat toward the poles, the high-speed streams migrate along with them. The Sun's magnetic field also influences the solar wind. The Sun's field, like the Earth's, has basically a North and South magnetic pole, but the Sun's more complex magnetic field deviates from this "dipolar" structure during parts of the solar cycle, becoming most complicated during solar maximum, when the two magnetic poles swap places.

In the Earth's simpler magnetic field, field lines (the lines following the direction of force the Earth would exert on a magnetic objects) wrap around the planet, connecting the North and South magnetic poles. But in the Sun's field, the solar wind stretches the Sun's field lines near the equator far out into space. One region, corresponding loosely with one hemisphere, has more field lines pointing out from the Sun, and is called the positive sector, while the remaining region, with more field lines coming in, is called the negative sector. These sectors are divided by a equator, so at the Sun's surface, a point 15 degrees North of the equator would be above this equator in some areas and below it in others.

Out away from the Sun, the positive and negative sectors are bisected by an imaginary wavy curtain called the current sheet, which extends from this buckled equator. (It is called the current sheet because laws of physics state that there must be an electric current at the boundary between opposite magnetic fields and, indeed, there is a net flow of positive charges outward and negative particles inward in this region.) During the present

- more -

solar cycle, the region above the current sheet is the negative sector and, below it, the positive sector.

Back in early 1985, Pioneer 11 -- 15 degrees above the equatorial plane -- would find itself sometimes above and sometimes beneath the current sheet as the Sun rotated. Normally, as the Sun approaches solar minimum and the coronal holes retreat toward the poles, the current sheet's ridges flatten out. As we approached solar minimum in 1985, Pioneer 11 was located above the current sheet, in the negative sector more of the time. By mid-1985, Pioneer 11 was always in the negative sector, indicating that the current sheet had flattened out beneath it.

The closer you go to the current sheet, the slower the solar wind. As the current sheet "flapped" down toward the equator, even with Voyager 2 and Pioneer 10, the solar winds slowed in this region and sped up near the poles. The equatorial winds slowed as far as Pioneer 10, showing that the Sun's magnetic field and the associated current sheet are exerting powerful control over the solar wind even at great distances.

"The Sun, its Corona and magnetic fields, and the solar wind are all part of one system," says Barnes. And even well past Pluto, the solar winds are apparently still under the control of the rest of the system.

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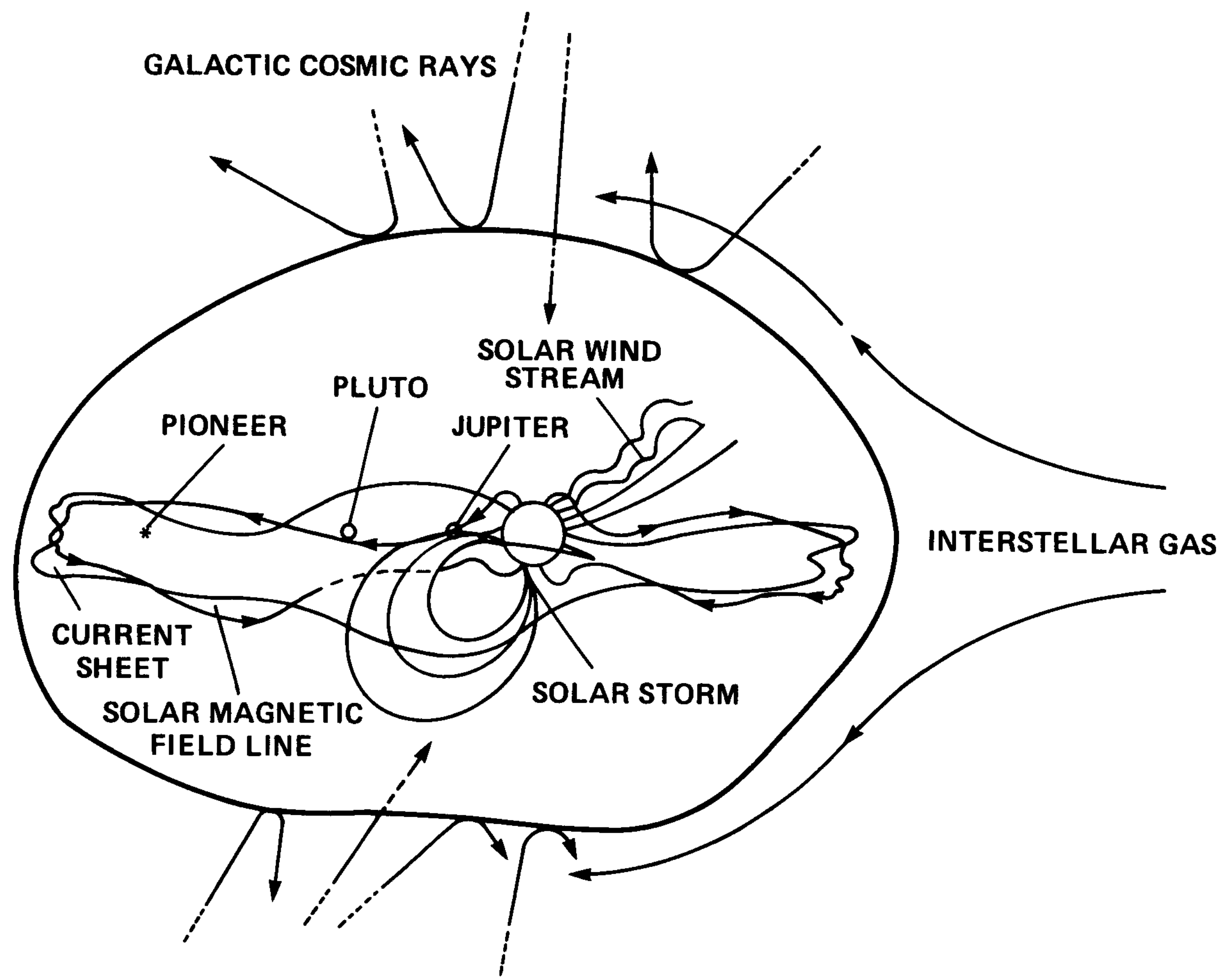
THE SUN'S ATMOSPHERE



*-PIONEER 10
6/13/88

NASA News

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Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

Peter W. Waller 415/694-5091
Sophie Wilkinson

For Release:

Immediate

Release No. 88-54

NASA-Ames Works on Aero-Space Plane

NASA's Ames Research Center, in collaboration with American industry, universities, the Department of Defense, and other NASA centers, is helping to develop a National Aero-Space Plane (NASP). Ames is using a variety of methods such as wind tunnel tests, supercomputer calculations, thermal protection research, and piloted flight simulation to help design the hypersonic plane. The plane is expected to fly by the year 2000.

One version of the NASP is designed to take off from an airport, thrust through the sound barrier to Mach 25 (25 times the speed of sound, or about 18,000 mph), and boost itself into orbit around the earth. It may operate on military missions and as a space launch vehicle to carry supplies and building materials to other vehicles and installations orbiting the earth such as the U.S. space station. A second version will be able to fly civilian passengers from Los Angeles to Tokyo in only two hours, traveling up to about 8,800 mph.

NASA has a great part of the responsibility for developing the technology for the aerospace plane. NASA-Ames scientists are evaluating the plane's basic shape and propulsion system with the use of wind tunnels and Ames' powerful computer system, the Numerical Aerodynamic Simulation (NAS) system. Researchers are studying thermal protection materials for the aircraft, drawing on space shuttle experience and developing new techniques for cooling

- more -

the leading edges of the nose and wings. Models are being tested for response to heat and weight loads, and artificial intelligence systems are being developed to help fly the aircraft.

Ames scientists are also doing research in engines, behavior of air and combustion flows at supersonic (Mach 1 to Mach 5, or about 700 to 3,600 mph) and hypersonic (above Mach 5) speeds, and analysis of promising aircraft shapes.

The plane has special design requirements. It needs a propulsion system capable of taking it from the dense ground-level environment into the thin upper atmosphere where air-breathing engines have difficulty operating. The plane must be protected by a unique structural design and heat-resistant materials in order to survive the intense heat and pressure loads imposed by hypersonic flight. Before the first flight test, scientists must simulate flight of the plane on computers because no wind tunnel can reliably simulate the flow conditions adequately accounting for combinations of geometric aircraft scale, altitude and velocity for conditions at higher Mach numbers.

According to James Arnold, Chairman of the Aero-Space Plane working group at Ames, the Center's greatest investment in the program is in fluid and thermal physics. The scientists involved are using supercomputers, wind tunnels, arc jets and ballistic ranges to study the aerodynamics, engine performance and thermal protection of the aerospace plane.

A computer with the largest memory in the world, called the Cray-2, is at the heart of the calculations of the aerospace plane's aerodynamics. (The aerodynamics of an aircraft concern the motion of air and the effect of the forces it exerts on the plane when it flies.) The Cray-2 can be used to describe the movement of air around the plane under conditions generated by flight.

Of course the scientists must confirm that their computations are correct. To make sure that the computer codes accurately predict real air flow, Ames scientists perform code validation experiments. In these experiments scientists study the flow of air around test models in wind tunnels and compare it to the

- more -

computer's aerodynamic predictions. Once they have confirmed the computer's predictions, and assured themselves that all of the appropriate flow physics has been accounted for, the scientists can be confident that computations of flow for flight simulations that cannot be obtained in a wind tunnel will be reliable.

As an example Ames is using the Cray-2 computer to study other characteristics of the plane during flight, such as skin friction. These computations are confirmed by ballistic range tests. The skin friction on small test cones is measured during flight at speeds around Mach 20 (14,000 mph) and compared to computer predictions.

The aerodynamics of the plane are dictated by the craft's shape and engines. The Cray-2 computer is being used at Ames to design the aerospace plane's body and engines, and to integrate the engines into the airframe. Integration of the engines is crucial because air is partially compressed in the shock wave over the forebody of the craft before entering the engines, and the afterbody of the airplane serves as the engines' exhaust nozzle. This represents an unprecedented challenge in aeronautical design.

One major technological hurdle to be overcome is the propulsion system for the aerospace plane. To meet this need, National Aero-Space Plane researchers are developing a unique air-breathing engine called the scramjet which will be capable of propelling the plane in hypersonic flight. As the plane speeds up past about Mach 5 (3,600 mph), propulsion will shift over from more conventional engines to scramjets.

Ames current contributions in propulsion are focused on calculating and measuring flows in inlets and nozzles of the engine. Ames scientists will also test the engine's combustion system design by simulating combustor flows in the Center's powerful 100 megawatt arc jet.

The materials covering the aerospace plane must be able to withstand the high temperatures and pressures generated by flight at hypersonic speed. The plane could be covered with a metal skin, which would require complicated plumbing to cool the aircraft's "hot spots" during flight. As an alternative, Ames scientists are studying ceramic-ceramic composites made of silicon carbide insulation which can withstand temperatures in excess of 2,500 degrees Fahrenheit. They are also studying methods to lower the temperature of the plane's leading edges and nose pit during flight. One promising concept is called the "spinning leading edge."

In principal, a ball spinning in the nose of the plane (or a cylinder in a wing's leading edge) can distribute incoming heat by spreading the heat over a larger area in comparison to a fixed nose tip. The temperature which the plane's nose tip encounters will, therefore, be lower than on a plane which has a conventional fixed conical nose.

Ames' arc jet facilities will be used to simulate the hot gas flow over components of the aerospace plane structure. These tests will evaluate how both materials and structures perform when heated by air at hypersonic speeds. This type of test and those in the ballistic ranges are the only ways the complex chemical interactions of air at high temperature with candidate materials and structures can be evaluated.

Aerospace plane scientists and engineers are trying to develop a strong very lightweight structure for the aircraft with an efficient thermal protection system. Scientists at Ames Flight Loads Research Facility are using computer-driven heat lamps and hydraulic pumps to apply heat and weight loads to test candidate aircraft components. When a component is heated, scientists measure the distribution of heat over its surface and compare it to data obtained from existing high-speed aircraft and the Space Shuttle. Hydraulic pumps are being used to study wing deflections which can also be compared with actual flight data. With these results, computational codes can be developed and validated to predict thermal distribution and load response on the aerospace plane before it is built.

There are three airframe and two propulsion contractors currently working on the NASP program. The designs of the five contractors will be judged and, provided it is feasible, the most promising will lead to construction of a new experimental aircraft (the X-30). With government approval, one or more of these X-30's will be built and flown in the early 1990's. Once the technology is proven the aerospace plane itself will be built.

In the meantime, the contractors will make use of Ames facilities to test the potential of their designs. For instance, McDonnell Douglas and General Dynamics will each take some of their concepts to Ames to test them in the wind tunnels.

This then is the real thrust of the program: conduct an intense program of technology development and design studies in a national effort. Providing this effort indicates it is feasible to go ahead with the operational National Aero-Space Plane, build a demonstrator aircraft, fly it, and prove that it works. Additional lessons will be learned in this demonstration process and will result in an even better operational fleet.

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Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

For Release:

Diane Stanley 415/694-5091

Release No. 88-56 IMMEDIATE

NOTE TO EDITORS:

World authorities on Interstellar Dust will meet July 26-30, 1988, at Santa Clara University in Santa Clara, Calif., to discuss recent advances in understanding this galactic raw material. Interstellar dust gathers in dark patches in luminous, gas clouds in space that scientists believe form stars, planets and comets.

Revolutionary breakthroughs in astronomical observation techniques, laboratory simulations of interstellar space, and theoretical work in the last decade will provide a more precise definition of the dust's composition and characteristics. The IAU Symposium on Interstellar Dust, the first in 18 years, is co-sponsored by NASA Ames Research Center and the International Astronomical Union.

Media are invited to all sessions of the symposium at Daly Science Bldg. on the Santa Clara University campus:

Tue	Session I	- DUST IN THE DIFFUSE INTERSTELLAR MEDIUM
Wed	Session II	- THE OVERIDENTIFIED INFRARED EMISSION BANDS
Thu	Session III	- DUST IN DENSE CLOUDS
Fri	Session IV	- GRAIN OPTICAL PROPERTIES, EMISSION AND DESTRUCTION
	Session V	- INTERSTELLAR DUST MODELS
Sat	Session VI	- SOLAR SYSTEM-INTERSTELLAR DUST CONNECTION
	Session VII	- DUST FORMATION AND DESTRUCTION

-more-

Key questions to be considered are: 1) What is the dust made of in different regions of interstellar space - is it icy, rocky, organic, sticky, hard, soft, brittle? 2) Where is the important interstellar chemistry most heavily concentrated - in the gas clouds, or in molecules collecting on the icy dust particles in the clouds?

3) What can the ice and dust from Comet Halley, when compared with infrared measurements from pre-planetary nebulae, reveal about similarities and differences in our systems? Our solar system has moved away from its original dust cloud. Comets - in distant, cold orbits around our solar system - are removed from solar induced chemistry and gravitional effects. They are thought to contain pristine, interstellar grains from the original dust cloud and the formation of our solar system.

4) How are the huge, ubiquitous, hydrocarbon molecules observed throughout interstellar space made? These giant (by interstellar standards), complex, organic molecules, structured like chicken wire, are stable in space for billions of years. 5) Are these high-temperature forms of carbon (polycyclic aromatic hydrocarbons or PAH) formed in the atmospheres of red giant stars - where conditions (temperatures, chemistry, and pressures) are similar to those in a combustion engine's production of soot?

6) Are PAH the long sought after building blocks of carbon produced by these stars? 7) Can we find, by studying comets and meteorites, these complex organic molecules formed in stellar atmospheres billions of years ago?

The symposium is co-organized by Dr. Louis Allamandola, Space Science Division, NASA Ames Research Center, in Mountain View, Calif. For registration and schedule information call Janice Varney at 415/694-5528 or Santa Clara Conference Services at 408/554-4303.

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July 19, 1988

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Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

Donald G. James 415/694-5091

For Release:

Immediate

Release No. 88-58

NASA ANNOUNCES BREAKTHROUGH IN COMPUTER TECHNOLOGY

Large, sophisticated scientific computer codes may soon run on desktop computers thanks to a major breakthrough in computing technology, NASA announced today.

Researchers at Advanced Rotorcraft Technology, Inc. (ART, Inc.) of Mountain View, Calif., have developed powerful tools that easily convert serial FORTRAN programs to run on parallel computers. The power of this breakthrough was recently demonstrated to 70 NASA engineers and managers at Advanced Rotorcraft Technology's facility with a piloted, real-time simulation of the Rotor Systems Research Aircraft/X-Wing aircraft on a modified DEC Micro VAX II desktop computer.

This research was funded by the Army Aviation Research and Technology Activity and managed by NASA's Ames Research Center under the Small Business Innovative Research program.

ART's President, Dr. Ron DuVal said, "This advance could have the same advantages that higher order languages, e.g., FORTRAN, PASCAL, C, BASIC, have over programming in machine language."

By taking advantage of parallel processing technology, engineers can have expanded power on easily afforded computers. NASA-Ames engineer Gary Hill says, "parallel processing is conceptually obvious but very difficult in practice. Until now, programming parallel computers required the programmer to be conversant in the physics and mathematics of the application, plus

- more -

the computers' hardware design and systems software as well." With this new technique, Hill says, "parallel processing just became user friendly."

Computers normally execute "serially" - marching through the code solving one line of program at a time. Scientific programs modeling physical phenomena, e.g., simulations, have to calculate many simultaneous events sequentially. Parallel processing employs more than one processor. It is like having several mathematicians to work a large problem instead of just one. At stages in the problem, each will be waiting for answers from another, but interim solutions can be derived concurrently. With complex computer codes, the trick is to know which routines depend on each other, to avoid data transfer delays and to efficiently use all processors.

The software tools developed by ART, Inc. include a development system that helps the programmer convert serial programs for coarse-grained parallel processing and a parallel-processing executive that performs real-time data management. The development system has two parts: a decomposing tool and a mapping tool. The decomposing tool tracks the data flow of a program and breaks it into the fundamental subroutines and loops. The mapping tool provides a structure chart which allows the user to identify data dependencies. The benefits of these new tools allow the execution of massive programs on smaller computers providing timely and cost efficient answers.

Modifications that convert a DEC Micro VAX II into a parallel processor are another invention of ART, Inc. Four Vaccelerator processor boards were added to the backplane of a Micro VAX II along with high speed shared memory. The Vaccelerator includes a Weitek floating point chip set and is built around an 80386 processor. This modification is a low cost alternative to acquire a parallel processor.

Rotorcraft simulations are many times more difficult than fixed wing aircraft. Rotors produce nonlinear aerodynamic reactions, have more degrees of freedom and higher frequency dynamics. X-Wing is a four bladed rotorcraft that stops its rotor

- more -

in flight to achieve fixed wing flight speeds. The RSRA, a flying test bed, with the X-Wing rotor have additional degrees of freedom plus complicated interactions from the X-Wing's unique circulation control rotor and the RSRA's variable incidence wing. The simulation performed conversions between rotary wing to fixed wing flight in real-time, while being piloted from a joy stick. Simulation code cycle time improved from 95 milliseconds (ms) to less that 15 ms on the parallel processor.

Rotorcraft simulation is likely to be the most immediate beneficiary of this advance in computer technology. Other disciplines with potential applications from this fallout of NASA/Defense Advanced Projects Agency research on the futuristic X-Wing include: simulation of multiple aircraft, flight control computers, computational fluid dynamics, structural analysis, artificial intelligence, data acquisition and process monitoring.

Immense utility is seen for this invention for parallelizing serial codes, because it is applicable to all parallel computers, from micros to the Mark III Hypercube at NASA's Jet Propulsion Laboratory in Pasadena, Calif. Computer chips will continue to get faster - with time and investment of money, but the speed of light will always hamper the single processor computer. The new ART, Inc. system software doesn't have that limitation.

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Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

For Release:

C.J. Fenrick 415/694-5091

Immediate

Release No. 88-59

NOTE TO EDITORS/NEWS DIRECTORS:

NASA Bedrest News Conference Set

The Space Physiology Branch will conduct a news conference on the results of its Summer Bedrest Study on Wednesday, September 7, 1988, at 9:30 a.m., in Conference Room B-39, Life Sciences Building N-239, at NASA's Ames Research Center, Moffett Field, Calif.

Sara B. Arnaud M.D., principal investigator, and some of the participants will describe a recent "Bed Rest" Study which focused on bone and calcium metabolism.

The Center has been conducting bedrest studies since 1971. Data from these simulated weightlessness studies will help NASA to understand the mechanisms responsible for the changes observed in long duration space missions and to determine how weightlessness affects the body and its ability to react to reentry stresses. This is particularly important in the development of protective procedures and countermeasures. The number of participants, their sex, duration of the study, and the regimen and goals of this year's study will be the subject of the news conference. Still pictures which depict the nature of the experiments and the activities of the subjects will be available for news media representatives. A short tour of the Human Research Facility will take place immediately after the conference.

8/12/88

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Ames Research Center
Moffett Field, California 94035
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For Release:

Diane Stanley 415/694-5091

Release No. 88-60 IMMEDIATE

NOTE TO EDITORS:

Exobiology's role in current and near term NASA missions will be reviewed in a three day meeting with leading world authorities on solar system studies. The Symposium on Exobiology in Solar System Exploration will be held August 24-26, 1988, at the Sunnyvale Hilton Inn, Sunnyvale, Calif. Exobiology addresses the most fundamental question man can ask - how did life begin and evolve in the solar system?

A press conference will be held 11 a.m., Friday, August 26, Bldg. 245 at NASA Ames Research Center, Moffett Field, Calif. The symposium, sponsored by Ames Research Center, will cover all significant research related to the emergence of life in the solar system.

"We plan to ask all the exobiology questions at once, and bring the world up to date on the places to search for life related clues," said Glenn Carle, Solar Systems Exploration Branch Chief and conference organizer.

The giant planets, Jupiter and Saturn, their satellites, Europa and Titan, Mars, and comets are of particular interest to exobiologists. Comprehensive reviews of these solar system bodies will be presented.

Some basic questions to be considered are: 1) Where did Earth's carbon-rich environment come from? 2) How did life begin on Earth? 3) What can Titan's thick atmosphere, Europa's oceans, and Martian soil tell us about the origin of life on Earth? 4) Were comets the building blocks of the outer planets?

5) Are comets the source of Earth's organic material, atmosphere and oceans?

Deep river channels and lake beds on Mars, and evidence for lakes on early Venus suggest an early inner solar system with abundant water, a necessary condition for life as we know it. Ice crusted Europa, Jupiter's smallest moon, has suspected planet-wrapping oceans beneath its smooth surface and evidence of organic material surfacing in cracks that continually melt and refreeze. Jupiter's huge, atmospheric storms are a natural laboratory for chemical evolution.

Titan, Saturn's largest moon, has thick methane and nitrogen clouds that may obscure liquid methane and nitrogen on its surface. Titan, the only satellite in the solar system with a substantial atmosphere, may serve as a model for Earth's pre-biological stages.

Current theories of solar system formation suggest that all matter in the solar system originated from interstellar dust and gas molecules. The theories propose that these original constituents may be preserved intact in comets. What can these primordial bodies, with their simple and complex organic molecules, ice, and dust, tell us about the solar system's earliest days?

NASA's plans to investigate these questions now include Project Galileo to Jupiter, the Mars Observer Mission, a Mars Rover/Sample Return Mission, the proposed Comet Rendezvous Asteroid Flyby Mission and Titan-Cassini Mission, a NASA/ESA cooperative venture to Saturn's satellite. Experiments for these missions will be considered and directions for future exobiological research will be suggested.

Media are invited to attend all conference sessions. Still photos and videotape will be available at the press conference. The press conference will be carried on NASA Select television (Satcom F2R, transponder 13, 72 degrees west longitude.) Video scene logs will be available to TV editors from Ames Public Information Office at 415/694-5091.

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August 16, 1988

PRELIMINARY AGENDA
(Revised 8/15/88)

The Symposium on Exobiology in Solar System Exploration
Sunnyvale Hilton, Sunnyvale, California
August 24 - 26, 1988

Wednesday, August 24, 1988

Morning		Speaker/Author(s)
8:00	Registration	
9:00	Welcome and Introduction	**D. L. Compton**
9:10	Future Opportunities for Exobiological Research in the Solar System	**G. Carle**/D. DeFrees
9:50	Coffee Break	
10:10	Exobiology--Past and Present	**H. P. Klein**
11:10	Asteroids and Other Small Bodies	**D. Cruikshank**/J. Kerridge
12:10	Lunch	

Afternoon

1:30	Comets: Chemistry and Origins, or: "Why Comets are Likely to be Connected to the Origin of Life on the Earth"	**A. Delsemme**
2:30	Comet Rendezvous Asteroid Flyby Mission	**M. Neugebauer**/P. Weissman
3:30	Coffee Break	
3:50	Cosmic Dust	**D. Brownlee**/S. Sandford
4:50	Biogenic Elements and Impact Phenomena on the Moon	**E. Gibson**/S. Chang
5:50	Break for the Day	

Evening

6:00	No Host Mixer

Thursday, August 25, 1988

Morning		Speaker/Author(s)
8:00	Venus: A Search for Clues to Early Biological Possibilities	**L. Colin**/J. Kasting
9:00	Giant Planets: Clues on Past and Current Organic Chemistry in the Outer Solar System	**J. Pollack**/S. Atreya
10:00	Coffee Break	
10:20	Project Galileo	**T. Johnson**/R. Young, L. Colin
11:20	Europa	**J. Oro**/S. Squyres, R. Reynolds
12:20	Lunch	

Thursday, August 25, 1988

Afternoon		Speaker/Author(s)
2:00	The Atmosphere and Surface of Titan	**T. Scattergood**/T. Owen, D. Gautier, F. Raulin
3:00	Coffee Break	
3:15	Titan-Cassini Mission	**S. Kerridge**/W. Flury, J. P. LeBreton, G. Scoon, D. Stetson, R. Stoller, G. Tan
4:15	Future NASA Solar System Exploration Activities and International Opportunities	**G. Briggs**/B. French, T. Ramlose
5:15	Break for the Day	

Evening

8:00 Evening Speaker -- **Tom Paine**

Friday, August 26, 1988

Morning		Speaker/Author(s)
9:00	Mars: A Reassessment of its Interest to Exobiology	**C. McKay**/M. Carr
10:00	Mars Observer Mission: Toward a Basic Understanding of Mars	**A. Albee**
11:00	Lunch	

Afternoon		
1:30	Mars Rover Sample Return Mission	**M. Carr**/C. McKay
2:30	Coffee Break	
2:45	Mission Supporting Research Studies and Development Opportunities for Future Missions	**J. Rummel**
3:45	Closing Address	**G. Carle**
4:00	End Symposium	

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Moffett Field, California 94035
AC 415 694-5091

C.J. Fenrick 415/694-5091

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SUPERSONIC STOVL JET MODEL FACES TEST

Aerodynamics and propulsion tests of a full-scale powered wind tunnel model based on the General Dynamics Corporation-designed E-7 STOVL (Short Take-Off and Vertical Landing) aircraft will be conducted at NASA's Ames Research Center, Mountain View, Calif., this summer and fall.

NASA's Full-Scale Aerodynamics Research Division, the U.S. Department of Defense Advanced Research Projects Agency (DARPA), and the Canadian Department of Regional Industrial Expansion are conducting the tests. The wind tunnel model was jointly designed, fabricated, and assembled by NASA and Boeing Canada, de Havilland Division, and is powered by a Rolls Royce Spey 801-SF engine. The partially completed model was exhibited at the National Full-Scale Aerodynamics Facility dedication in December, 1987.

On Thursday, August 4, the E-7 supersonic jet model was placed in the Outdoor Aerodynamic Research Facility (OARF) for its initial propulsion system tests. These tests were successfully completed on August 19. During the last week of August, the E-7 model will be installed in the recently modified 40- x 80-Foot Wind Tunnel. This will be the first full-scale aircraft model to be tested in this wind tunnel since its modification. It is also anticipated that the E-7 model will be the first full-scale aircraft model to be tested in the new 80- x 120-Foot Wind Tunnel. These tests w ll measure the aerodynamic characteristics of the complete aircraft during low speed flight.

- more -

This aircraft concept is designed for takeoff from a short field less than 500 feet long, and for a vertical landing from hover. During takeoff and landing, the flow from the engine is divided into two streams. The engine fan bypass flow powers the ejector and the turbine core flow powers the ventral nozzle. For this concept in hover, lift is generated both by ejectors, located in the wing on each side of the fuselage, and by a ventral nozzle which is vectored vertically. The engine fan air provides the source of the high pressure air for the ejector at a pressure ratio of approximately 3.0. In the cruise mode, the fan air and the ventral nozzle are directed aft; the ejector areas are closed.

Future work with this model will include adapting the model to the more powerful GE F110 engine. This engine will be operated in a mixed flow mode. In hover both the engine bypass flow and core flow will be mixed. A portion of this high energy air will be ducted to the ejectors and the remainder to a ventral nozzle to provide vertical lift. In cruise, the ejector and the ventral nozzle will be closed and the engine exhaust will be controlled through an aft vectored thrust nozzle.

Following the current tests at Ames Research Center, the model will be transported to Boeing Canada, de Havilland Division, for adaptation to the model of the F110 engine. It will then be transported to NASA's Lewis Research Center, Cleveland, Ohio.

Lewis Research Center will conduct the first testing of the modified model using the mixed flow mode and will validate the operation of a fully integrated flight/propulsion control system. This control system is generically similar to the control system required for most supersonic STOVL aircraft concepts. After testing at Lewis, the model will be made available to Ames Research Center for additional wind tunnel and hover tests.

This is a unique opportunity to validate the performance of an ejector augmentor packaged in a supersonic airframe and configured for STOVL operation. A successful conclusion of these tests will establish the supersonic STOVL concept as a strong contender for the 20th century fighter aircraft. A photo of the E-7 in the OARF is reproduced for this news release.

8/30/88


NASA
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DARPA

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Moffett Field, California 94035
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C. J. Fenrick IMMEDIATE

Release No. 88-65

FASTEST SUPERCOMPUTER IN THE WORLD DELIVERED TO NASA AMES

A Cray Y-MP, the fastest supercomputer in the world, arrived at NASA's Ames Research Center this week. Ames is the first customer to take delivery of this new supercomputer.

The Cray Y-MP will be installed as the High Speed Processor-2 (HSP-2) in the Numerical Aerodynamic Simulation (NAS) Facility at Ames. After check out and acceptance it will be incorporated into the production system with HSP-1, a Cray-2 supercomputer. These systems are used for the simulation of aircraft and aerospace vehicles by researchers at government, industry, and universities throughout the nation.

The Y-MP system has eight central processors and 32 million 64-bit words (256 million bytes) of central memory, with 256 million words (two billion bytes) of high-performance secondary memory through an solid-state storage device. The system's input/output features include the capability of handling up to 240 billion bytes of high-speed storage. It uses the Cray operating system UNICOS, based on UNIX System V, and a suite of compilers, utilities, and other software tools.

The supercomputer offers performance 30 times that of the Cray-1 system introduced in 1976 and three times that of the largest CRAY X-MP computer system.

The contract value for the High Speed Processor 2 (HSP-2) is 36.5 million, and $10.2 million for the hardware upgrade options. The acquisition of the HSP-2 consists of a 36 month lease.

-end- August 31, 1988

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Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

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Release No. 88-69 Immediate

INFORMATION SUMMARIES: SUMMER 1988 BEDREST STUDY

NASA Ames Research Center (ARC) conducted its annual bedrest study this summer. In past bedrest studies, information was collected from these simulated weightlessness exercises. NASA has used this data to understand the mechanisms responsible for the changes observed in long duration space missions and to determine how weightlessness affects the body and its ability to react to re-entry stresses. This is particularly important in the development of protective procedures and countermeasures.

All eight participants in this study that ended on Friday, August 12 were healthy males, aged 32 - 45. They were all California residents. The following is their name and city of residency: Chuck Gretton, Camp Meeker; Sam Kampschmidt, South San Francisco; Bill McClain, Oakland; Michael J. Monges, Morgan Hill; Russell Nelson, San Jose; Robert Norby, Oakland; Martin P. Rawson, Cupertino; and Jeffrey Steiger, Seaside.

The protocol of this study was designed to determine the short term effect of 0 G on the mineralization of bone. The study was a pilot study for a similar one to be carried out on astronauts during a 7 day mission, and followed the same protocol. The study began 20 days before "launch" or bedrest with the collection of historical information on diet and exercise, baseline samples of blood, urine and saliva, administration of bone markers, and testing, to establish the status of some aspects of bone, muscle, vascular, and endocrine metabolism before the simulated flight.

Simulated launch took place at the beginning of the bedrest period when all subjects began a 7 day period of bedrest in a minus six (-6) degree head down position. Subjects maintained this position, to remove the weight from the lower half of the body, for 24 hours a day and had tests similar to those done before bedrest. After the 7th bedrest day, "landing" was simulated by getting up and becoming active and ambulatory again. During the period of recovery, which lasted 20 days, a small sample of bone tissue was taken from the hip bone, to determine

-more-

September 6, 1988

the short term response of bone, to lack of weight, and the testing procedures carried earlier, repeated for the third time.

The following ARC investigators and support persons conducted the current bedrest study:

NASA, Ames Research Center
Sara B. Arnaud, M.D.
Research Scientist,
Space Physiology Branch

Joan Vernikos-Danellis, Ph.D.,
acting Associate Director,
Directorate of Space Research

Alan Hargens, Ph.D., Chief,
Space Physiology Branch

Lanny Keil, Ph.D., Robert Whelan, Ph.D., and Michael Aratow, M.D., all research scientists in the Space Physiology Branch

Dee O'Hara, B.S., R.N.
Manager, Human Research Facility

Nursing Staff- Bionetics Corp.
Edith Crofoot, R.N., nurse supervisor

U.S. Veteran Administration Medical Centers
Donald Sherrard, M.D., Seattle, Washington
Robert Marcus, M.D., Director, Aging Study Unit, Geriatric Research, Education, and Clinical Center, (GRECC),Palo Alto
M. Kazemi, R.N., GRECC, Palo Alto

Stanford University
Charles Steele, Ph.D., School of Engineering
Robert Marcus, M.D.

Spectroscan, San Bruno, Calif.
Burton Silver, Ph.D.

Numerous other un-named university co-investigators came to Ames and assisted in the bedrest study. Ranita A. Dalton, supervisor, and D. Gail Snyder, project manager, work for the Bionetics Corp., support services contractor to the Human Research Facility. This organization recruits and provides initial interviewing and screening of men and women subjects, as well as dietetic and nutritional support for the study.

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For Release:

Diane Stanley 415/694-5091

Release No. 88-71 IMMEDIATE

NASA EARTH RESOURCES AIRCRAFT TO AID
YELLOWSTONE FIRE CONTROL EFFORTS

NASA Ames Research Center's ER-2 and C130 aircraft are embarking on multiple infrared thermal mapping missions over the Yellowstone National Park area that will aid fire control efforts underway. NASA's remote sensing aircraft are equipped with thermal infrared sensors that "see" through the thick layers of smoke now blanketing the entire region.

Data reduction systems and high resolution television monitors, to be ground based at Greater Yellowstone Area Unified Command in West Yellowstone, Montana, for the ER-2 and flown on board the C130, will give fire officials valuable real time images of new fires and the advancing fire front.

The fire line at Yellowstone National Park varies with wind speed and direction. Smoke plumes averaging more than 30,000 feet drop debris ahead of the fire lines, starting new spot fires. Firefighters say "it's like stopping a speeding freight train with your hands." Knowing the location, size, speed, and intensity of the fires will help fire officials prioritize their available manpower and equipment.

NASA's ER-2, flying at approximately 65,000 feet and 400 knots, can provide the only complete high resolution thermal map of the 4000 square mile fire area, in about two hours. The aircraft will transect the area in 12 flight paths while the multispectral scanner records thermal energy from 11 discrete wavelength bands of visible, infrared, and thermal spectra.

A NASA downlinking capability, being transported to the fire control center at West Yellowstone, will make the scanner information immediately available to fire officials and the firefighting teams. The detailed spectral data will be converted to video signal on board the ER-2, transmitted to the downlink's ground receiver, computer enhanced, and displayed on a high resolution television screen at the fire control center.

NASA personnel at the West Yellowstone ground station will transcribe the thermal data onto topographical maps for the firefighting teams. Video recordings of the overflights will be available for the resource agencies' strategy meetings. The ER-2 will be based at NASA Ames Research Center at Moffett Field, Calif., who has management responsibility for the aircraft.

Earlier ER-2 overflights of the Yellowstone fire area have been based in Topeka, Kansas, where the aircraft was on assignment. Data travelled from Kansas to Ames Research Center in California to be analysed, and back to Yellowstone National Park. The downlink capability being established in West Yellowstone will eliminate costly data transportation time.

NASA's C130 aircraft, flying at 20-25,000 feet and 200 knots, will record higher resolution information on particular fires in the park. The aircraft will be equipped with a multispectral scanner and have the data reduction and video image display system on board. Interpretation and mapping of the fire area will be done in real time by U.S. Forest Service personnel while on the aircraft.

A scientific team, headed by Mr. James Brass at NASA Ames Research Center, has been conducting fire and smoke research since 1984. A base of equipment and experience has been developed that examines nutrient cycling and atmospheric chemistry on local, regional, and global scales. The research team includes United States Forest Service Riverside Fire Laboratory, Environmental Protection Agency, universities, and other national laboratories. Research data will be collected on the NASA/U.S. Forest Service Yellowstone collaborative flights.

The C130 aircraft departs Saturday, September 10, for Idaho Falls, Idaho, making its first overflight of Yellowstone enroute. ER-2 research flights will be made Friday, September 9, and the week of September 12. The ER-2 downlink's capability at West Yellowstone should be operational by about September 14.

Fire research is managed by the Ecosystem Science and Technology Branch of NASA Ames Life Science Division. NASA's ER-2 and C130 aircraft are managed by the Science and Application Aircraft Division of Ames Research Center in Mountain View, Calif.

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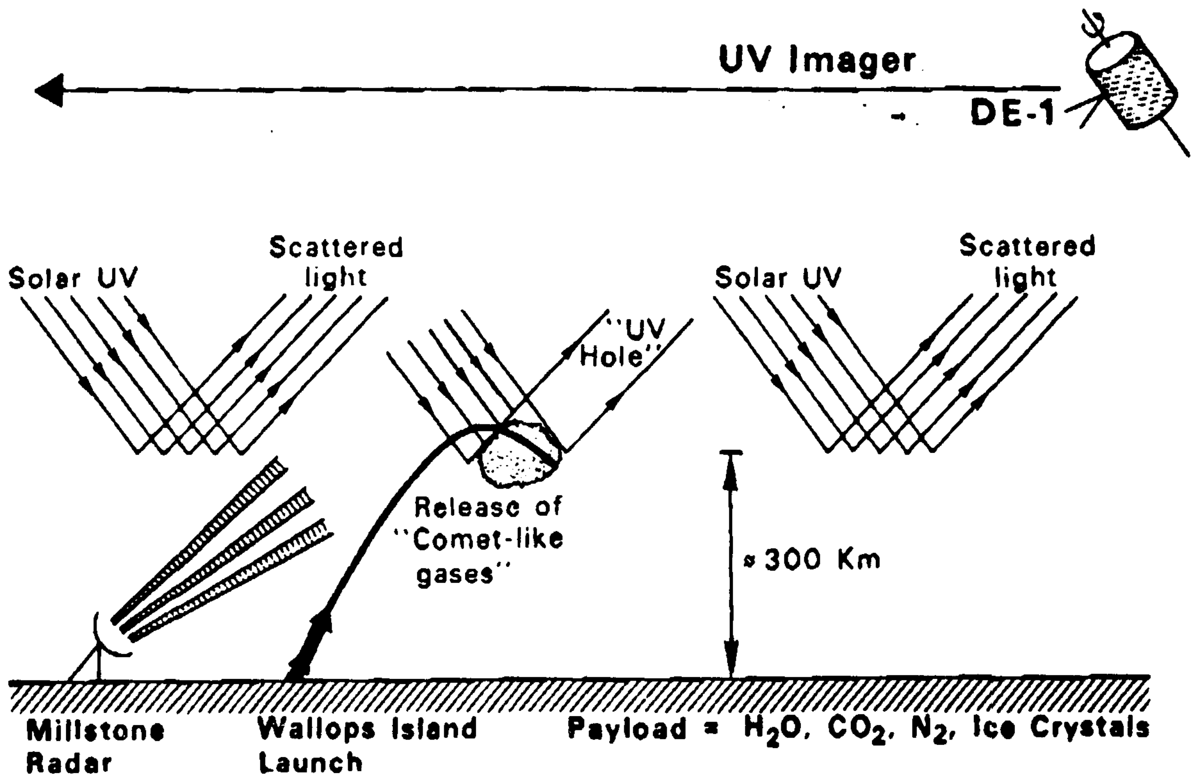
September 9, 1988

Environmental Reactions Induced by Comets

Project ERIC - - Experiment Design



- Ambient ionosphere measured by incoherent scatter radar.
- Release of comet-like molecules prior to satellite pass.
- UV imaging of region to document effects upon normal scattering process (Holes in UV signal?).
- Radar observes effects upon ionosphere (plasma hole).
- Post-event modelling of plasma, dayglow, observed effects.

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For Release:

Donald G. James 415/694-5091

Immediate

Release No. 88-74

SYRE RECEIVES 5-YEAR, $44 MILLION CONTRACT

NASA's Ames Research Center, Mountain View, Calif., has awarded a contract to SYRE, Moffett Field, Calif. SYRE is a joint venture sponsored by SYSCON Services Corp. and RMS Technologies, Inc. This is a 5-year, $44 million cost-plus-award-fee contract with a period of performance from September 1, 1988 through August 31, 1993.

SYRE will provide scientific and technical support services for the Flight Systems and Simulation Research Division, which is responsible for piloted flight simulation facilities at Ames Research Center. The majority of the effort performed by the contractor consists of facility support, simulation engineering and operations, graphics systems engineering, systems software, digital computer operations, systems maintenance, and design engineering.

The work will be performed on site at NASA-Ames Research Center, Moffett Field, Calif.

# # #

9/30/88

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Donald G. James 415/694-5091

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Immediate

Release No. 88-75

NSI TECHNOLOGY SERVICES CORP.
AWARDED $50 MILLION CONTRACT

NASA's Ames Research Center, Mountain View, Calif., has awarded a contract to NSI Technology Services Corp., Sunnyvale, Calif. This is a 5-year, $50 million cost-plus-award-fee contract with a period of performance from October 1, 1988 through September 30, 1993.

NSI will provide maintenance and technical support services for aircraft and flight simulators. The majority of the effort performed by the contractor consists of aircraft and flight simulator maintenance, engineering support, and expedition logistics support. This contract will support three ongoing Ames programs: the Airborne Research Program; the Airborne Science and Applications program; and the Aeronautics Research and Technology Program.

The work will be performed on site at NASA's Ames Research Center and will be managed out of the Ames Research Aircraft Operations Division.

# # #

9/30/88

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For Release:

John F. Murphy 415/694-4190

Immediate

Release No. 88-76

LESC SELECTED FOR CONTRACT AWARD

NASA's Ames Research Center, Mountain View, Calif., has awarded Lockheed Engineering & Management Sciences Company (LESC), Houston, a cost-plus-award-fee contract with a total estimated value of $37.5 million.

LESC will provide continuation of on-site services to support the Ames Research Center's Space Life Sciences Payloads Office (SLSPO) in the development of life sciences experiments and payloads for flight aboard the Space Shuttle, use on the Space Station and for international cooperative missions such as biosatellites.

LESC will be responsible for providing support in the following areas: project management; payload integration, test and operations; and flight experiment and ground support equipment development.

RCA Government Services, Cherry Hill, N.J., was the only unsuccessful offeror.

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10/5/88

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John F. Murphy 415/694-4190

Immediate

Release No. 88-77

QUAD S SELECTED FOR CONTRACT AWARD

NASA's Ames Research Center, Mountain View, Calif., has awarded Quad S. Company of Solana Beach, Calif., a cost-plus-award-fee (CPAF) contract. The 5-year contract has a proposed value of $37.9 million.

Quad S Company will be providing administrative support services to both the Ames Research Center, Moffett Field, Calif., and Dryden Flight Research Facility, Edwards, Calif. The contractor will be performing tasks within each of the following functional areas: Logistics, Technical Information, External Affairs, Acquisition, and Human Resources.

The contract represents the consolidation of four existing contracts for these services. Proposals were received from 13 firms for this requirement.

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10/5/88

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For Release:

Peter W. Waller 415/694-5091

Immediate

Release No. 88-79

TO EDITORS:

The fastest supercomputer in the world, the Cray Y-MP, a billion computation-per-second (CPS) machine, has been installed at NASA's Ames Research Center, Mountain View, Calif.

Beyond its normal sustained speed of one billion CPS, the new Y-MP has reached speeds, for short bursts, of 2.37 billion computations-per-second.

A news briefing on coming contributions of the Y-MP to U.S. science, technology and economics -- plus a tour of computer facilities -- will be held at Ames at 9:15 a.m., Thursday, Nov. 10.

The Ames Y-MP, the first of its kind, is the "second generation" high-speed processor for the NAS Supercomputer System -- a national facility located at Ames and available to a wide range of users country-wide. The Y-MP is four times faster than its predecessor, a Cray-2, until now "world's fastest."

- more -

With the new machine, NAS officials expect to create new science and technology, never before possible, in such fields as aerospace, chemistry, weather forecasting, and astrophysics.

For example, physics and flow conditions of flight speeds above 8,000 mph cannot be replicated in wind tunnels, existing or proposed. The flight of vehicles like the planned airfield-to-orbit National Aero-Space Plane will have to be reproduced by supercomputer. Computation power provided by the Y-MP will have similar applications in a variety of other fields.

Beyond the Y-MP, the short-term (1990) goal for NAS is a high-speed processor with a billion-word memory, and speed of three billion CPS. By the turn of the century, NAS officials seek speeds of a trillion (a thousand billion) CPS.

The NAS system is an important support for the U.S. aerospace industry--the largest favorable contributor to the U. S. trade balance in a period of declining exports and major trade deficits.

News reporters planning to attend the briefing should come to the Ames Visitor Reception Center. Photos and printed materials will be available, as will a TV clip with dramatic computer graphics, and other quality visuals.

The briefing will be transmitted by satellite on NASA Select via Satcom F-2R, transponder 13, C-band, 72 degrees West longitude, 3960.0 MHz, vertical polarization, audio 6.8 MHz.

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Peter W. Waller 415/694-5091

For Release:

November 10, 1988
10:00 a.m. PST

Release No. 88-80

WORLD'S FASTEST SUPERCOMPUTER INSTALLED AT NASA

A Cray Y-MP, the fastest supercomputer in the world, is currently undergoing acceptance tests in the Numerical Aerodynamic Simulation Facility (NAS) at NASA's Ames Research Center, Mountain View, Calif. Ames is the first organization to have the new supercomputer which is expected to be fully operational by January 1989.

The Cray Y-MP can exceed one billion computations per second in sustained operation and has achieved peak speeds of 2.37 billion computations per second by concentrating all of its eight processors on a single scientific simulation. The sustained speed of one billion calculations per second is the highest for any existing computer in the world.

According to Ames Acting Deputy Director Victor L. Peterson, "the big increase in computation power provided by the Cray Y-MP will permit solutions to problems far too complex to be handled by previous supercomputers and will create important areas of brand-new technology. The availability of the Y-MP represents a major step forward for the U.S. aerospace industry, world leader in its field and the largest favorable contributor to the United States trade balance in a period of reduced exports and major trade deficits.

The Cray Y-MP is the next major building block in NASA's NAS supercomputer complex. The NAS System, one of the most advanced

- more -

supercomputer systems in existence, consists of a variety of sophisticated, high performance computers, data storage devices, computer networks and associated laboratories and facilities.

NAS is a national facility available to leading U.S. research institutions through a national network. It has long-term support from Congress to use the fastest available computers to achieve rapid progress in U.S. aerospace work and in other fields such as weather, astrophysics and chemistry. Current users of NAS include over 900 researchers with over 300 projects at 100 universities, aerospace firms, laboratories and other U.S. agencies.

Supercomputers like Cray's new Y-MP provide a way of replicating aircraft and spacecraft flight by virtually "flying" the craft inside the computer. To do this, the airflow is computed on a three-dimensional grid surrounding the vehicle which consists of as many as a million separate points. The number of computations required for flow simulation on this grid can reach one trillion.

The Cray Y-MP is the NAS System's "second generation" supercomputer. It will join the first NAS supercomputer generation, a Cray-2 which routinely provides a quarter of a billion computations per second, and move NAS closer to its short-term goal of a high-speed processor with a billion-word memory and computation power of three billion calculations per second.

NAS officials seek computation speeds of one trillion (one thousand billion) calculations per second before the turn of the century. Such a speed would revolutionize aerospace science by allowing researchers to reproduce a series of optimum designs for a given flight problem, calculating all the variables and doing it quickly.

Supercomputer systems are complementing and extending aerospace research now done in wind tunnels and high-velocity (4,000 to 15,000 mph) shock tunnels. The new Y-MP central processor will not only solve old problems four times as fast as existing systems, but will be used to investigate flow phenomena which cannot be investigated currently by wind tunnels or computers.

- more -

With the Y-MP, NAS will model complete vehicle configurations and will move toward reproducing air flows encountered in flight maneuvers. These include such difficult problems as modeling the flight of helicopters, powered-lift and tilt-rotor vehicles, and supersonic fighters in high-maneuverability, very-high angle-of-attack positions.

Another important application of the NAS supercomputer system is the modeling of air flows for hypersonic vehicles such as the National Aero-Space Plane and the Space Shuttle. The NAS system is the only way to produce these flows prior to flight test for vehicles in this speed range. Other aspects of National Aero-Space Plane flight to be studied include inlet, combustion, and exhaust nozzle problems for its supersonic ram-jet engine.

With arrival of the Cray Y-MP, the older Cray-2, the former NAS high-speed processor, will become a production machine. At the time it was installed in September 1985, the Cray-2 was the most powerful supercomputer in the world, with 256 million words of memory and speeds of 250 million operations per second.

The new Cray Y-MP supercomputer has eight processors, 32 million words of main memory and 256 million words of secondary semiconductor memory in the form of a solid state storage device. It is being acquired through a 36-month lease, with a contract value of $36.5 million plus an additional $10.2 million for hardware upgrade options.

The Cray Y-MP achieves higher computational speed through three key design features: very fast processors, a parallel processing capability and fast memory access. The speed of the processors relies on densely-packed components to shorten distances over which the computer's electronic messages travel at almost the speed of light and on faster switching, which is due to improved circuit design. Parallel processing enables all eight of the high-speed processors to be used in the solution of a single problem.

The memory of the Y-MP is constructed with bipolar switches, which have a faster access time than the Cray-2's metal oxide semiconductor memory.

- more -

The NAS plan is to always have the two fastest available high performance processors in operation. New faster machines will be acquired as they become available and the slower of the system's two previous machines will be retired. NAS researchers are working continuously with supercomputer producers to encourage them to reach the trillion-computation-per-second goal as soon as possible.

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Moffett Field, California 94035
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Peter W. Waller 415/694-5091

Immediate

Release No. 88-81

OLDEST SPACECRAFT "RETURNS TO EARTH"

After 23 years in solar orbit, Pioneer 6, humankind's oldest operating spacecraft, will return to the vicinity of its launch point -- the Earth -- on Nov. 26, 1988. On that day, the craft will pass within 1.16 million miles of the Earth, roughly five times the distance between the Earth and its Moon.

This near-Earth passage will radically alter Pioneer's orbit, increasing its year by 6 days (from 311 to 317 days), and enlarging its orbit by 6 million miles.

Although the 140-pound, solar-powered, spin-stabilized spacecraft has lapped Earth once every 5 3/4 years since its 1965 launch from Kennedy Space Center, Fla., never has the probe passed so close to its launch point -- the point where the two orbits touch.

With only five lunar distances separating them, Earth's gravitational pull will be strong enough to haul the craft toward

- more -

her own orbit, farther out from the Sun. Celestial mechanics then allow the probe to borrow back orbital momentum from the parent planet, thus increasing the size of its own orbit.

Drum-shaped, Pioneer 6 is 35 inches high and 37 inches in diameter. Shining solar cells cover its cylindrical sides and the craft is stabilized by its frictionless 60 rpm spin in the vacuum of space. Three instrument-bearing booms reach out at 120 degree angles, and the rugged little craft handles its own data processing, communications instrumentation, temperature control, and power. It has more than 56,000 parts.

Pioneer 6 was designed to study the Sun's atmosphere, the heliosphere. For 23 years, Pioneer 6 has radioed information on the turbulence of the solar wind back to scientists at NASA's Ames Research Center, Mountain View, Calif.

The solar wind is a million-mile-an-hour stream of ionized gases spiraling out from the Sun and through the solar system, causing, among other things, fluctuations in Earth's magnetic field.

Before Pioneer, the solar wind was thought to be a gentle, steady flow. Now scientists believe the wind actually is much more violent. Within it are regions of great turbulence where streams of fast moving particles slam through slower masses creating huge shock waves in their wake.

Other Pioneer 6 accomplishments include measuring the Sun's corona, from which the solar wind "boils off" into interplanetary space. As Pioneer circled behind the Sun, its radio signal passed through the solar corona. Changes in the signal have provided information about the corona.

Alone and in conjunction with similar probes, Pioneer 6 has helped correlate fluctuations in the Earth's magnetic field with solar storms. These huge bursts of solar wind lash Earth's magnetic field causing the so-called "geomagnetic" storms that now are thought to play a role in Earth's long-term weather. In 1973, Pioneer 6 gathered data on the tail of Comet Kahoutek as it passed through the solar system.

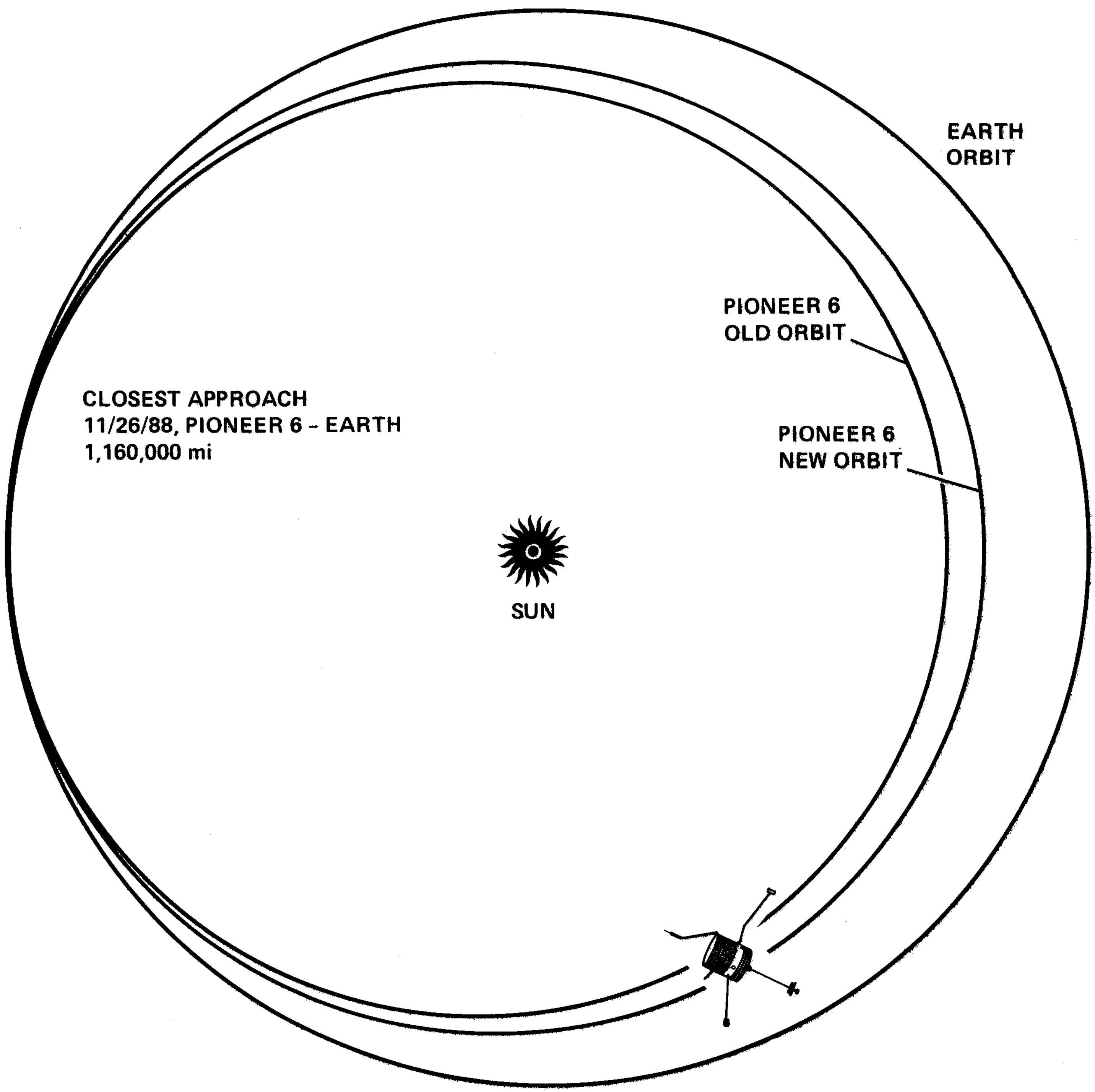
Two of Pioneer's six original instruments are still transmitting radio information on these phenomena. The probe, which cannot store information, transmits a round-the-clock signal from both its plasma analyzer and cosmic ray detector. However, NASA scientists can only track the probe as often as Deep Space Network time becomes available.

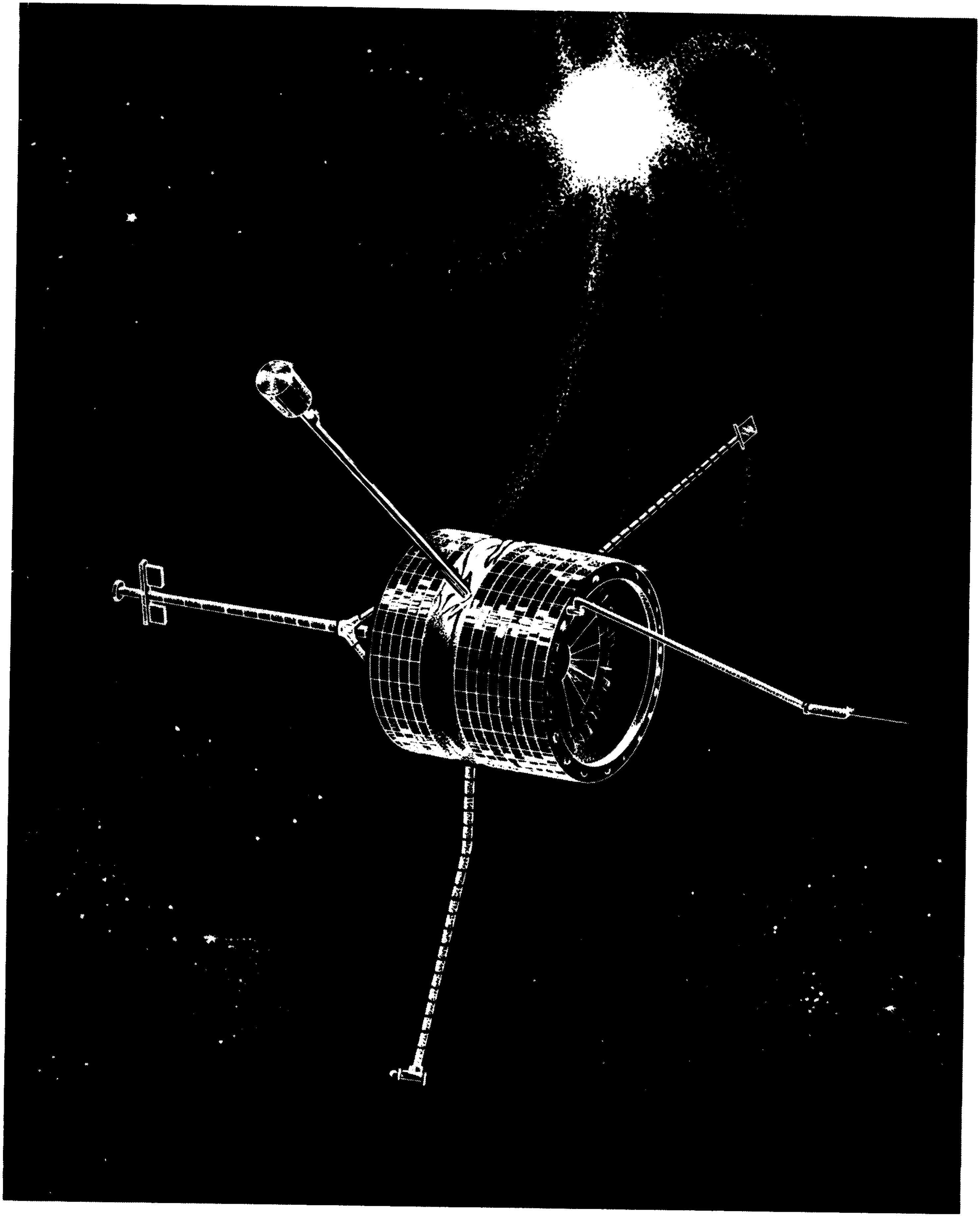
Three sister probes followed Pioneer 6 into solar orbit. During the period from 1966 to 1970, Pioneers 7, 8 and 9 were launched into coordinated orbits. With Pioneer 6, this spacecraft team forms a network of solar weather stations, monitoring the heliosphere, triangulating information back to Earth from the far side of the Sun, and increasing understanding of solar effects on Earth's magnetic field.

Though Pioneer 9 was declared "dead" after 18 years of exploration, its follow-on interplanetary explorers continue, all greatly exceeding their expected life-spans. After November 26, the oldest team member will be passing close to home.

CLOSE ENCOUNTER OF PIONEER 6 WITH EARTH

(Adds 6 days to year and 6 million miles to orbit)





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Ames Research Center
Moffett Field, California 94035
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C.J. Fenrick 415/694-5091

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Release No. 88-82

NASA SELECTS SMALL BUSINESS RESEARCH PROPOSALS

NASA recently announced the selection of 202 research proposals for immediate negotiation of phase I contracts in NASA's 1988 Small Business Innovation Research Program (SBIR). Proposals were selected from 166 small, high technology firms located in 28 states. It is anticipated that more than 20 additional phase I awards will be chosen at a later date.

SBIR objectives are to stimulate technological innovation in the United States, use small business (including minority and disadvantaged firms) to help meet Federal research and development needs and to encourage commercial applications of Federally supported research innovations.

These SBIR awards were selected competitively from 2,379 proposals received in response to the SBIR solicitation which closed July 22, 1988. Selections were made on the basis of scientific and technical merit, capabilities of the firm and value of the proposed research innovations to NASA. This is the 6th year of the NASA SBIR program which is conducted in accordance with Public Law 97-219, the Small Business Innovation Development Act of 1982, as amended by Public Law 99-443.

The names of the firms which were selected will be announced in a future release. However, the following are the cities in California where the firms are located: Mountain View, Sunnyvale, Palo Alto, San Mateo, Los Gatos, Santa Clara, San Jose, Davis,

- more -

Belmont, Los Angeles, Beverly Hills, Lawndale, Torrance, Los Alamitos, Pasadena, Canoga Park, Pacoima, Westlake Village, San Marcos, Solana Beach, San Diego, Costa Mesa, Laguna Hills, Irvine, Anaheim, and Moorpark.

Phase I projects are 6-month, fixed-price contract efforts, normally not exceeding $50,000, to establish the feasibility of innovative research concepts proposed by the contractor to meet agency needs or opportunities described in the SBIR program solicitation. Projects showing greatest promise are eligible to compete for phase II contracts to pursue concept development. Phase II contracts do not normally exceed 2-years duration and $500,000 value. Approximately one-half the phase I projects proceed into phase II.

Phase III activities may be commercial developments funded by the private sector or may be procurement or continued development for government use, funded by NASA outside the SBIR program.

As required by law, NASA allocates 1.25 percent of its annual research and development budget for SBIR. Approximately $10 million of NASA's 1989 SBIR budget will fund these 202 phase I projects. The program is managed by NASA's Office of Commercial Programs, NASA Headquarters, Washington, D.C., and all individual SBIR projects are managed by 8 NASA field centers.

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November 18, 1988

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Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

C. J. Fenrick 415/694-5091
Ames Research Center, Mountain View, Calif.

Mary Sandy 202/453-2754
Headquarters, Washington, D.C.

For Release:

Immediate

Release No. 88-88

COMPUTER SCIENCES CORP. SELECTED FOR NASA CONTRACT NEGOTIATION

NASA's Ames Research Center, Mountain View, Calif., has selected Computer Sciences Corp., El Segundo, Calif., for final negotiations leading to award of a 7-year, cost-plus-award-fee contract with an estimated value of $52 million.

Computer Sciences Corp. will provide support for planning, continuous development and operation of the Numerical Aerodynamic Simulation (NAS) system. The work includes management and administration; computational services including computer system operations and support, user services, software and hardware support and network communications support; research and advanced planning; systems analysis and development; auxiliary processing center; and facility support.

This acquisition will initiate a new contract that will be performed at NASA's Ames Research Center. The 7-year period of performance consists of one 3-year base period and two 2-year priced-option periods. The anticipated contract start date is Jan. 1, 1989.

12/2/88

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Release No. 88-89

KUIPER AIRBORNE OBSERVATORY TRACKS
ELEMENTS CREATED IN SUPERNOVA 1987A

Results from NASA Ames Research Center's C-141 Kuiper Airborne Observatory (KAO) supernova expeditions are helping to create a detailed picture of the birth of matter in one of nature's most powerful events.

The Kuiper team has completed its fourth deployment to observe Supernova 1987A, continuing its studies of charged (ionized) particles, and mass and ejection velocities of heavy metals produced in the giant blue star's explosion, first observed in February 1987.

The November 1988 mission found nickel, argon, and iron exploding outward at 1400 kilometers per second, the same high speed observed on the KAO's third supernova expedition in April of this year. Scientists also measured expected decreases in ionization and brightness levels of the explosion.

An anomalous red shift, or scattering of light, was again seen, but at a reduced level. This phenomenon had been predicted for astronomical objects, and first observed on the KAO's third mission. The effect is produced by argon and nickel photons interacting with electrons torn (by the shock wave) from hydrogen originally on the surface of the star.

The five week deployment to Christchurch, New Zealand, headed by Mission Manager James McClenahan, carried four experiments and accommodated more than 20 scientists. The Ames-led collaboration included near infrared wavelength investigations by Principal Investigators Fred Witteborn and Jesse Bregman, with Diane Wooden, Dave Rank, Tim Axelrod, and Martin Cohen. Longer infrared wavelength studies were conducted by Ames Principal Investigator Ed Erickson, with Mike Hass, Sean Colgan, and Steve Lord.

Previous Kuiper observations of the expanding ejected cloud have greatly contributed to understanding how the explosion proceeds. The first detections of nickel, argon, iron and radioactive cobalt produced in the SN 1987A core were made by the Kuiper crew's second mission in November 1987. Abundance and velocities of nickel, argon and iron formed in the core were first measured on the third mission in April 1988.

The prevailing theory, supported by recent observations, states that supernovae are great chemical factories in the universe - creating and hurling into interstellar space most of the elements heavier than carbon.

The collapse of a massive star is the only naturally occurring event with pressures and temperatures great enough to forge heavier elements. Stars with masses eight to 40 times that of our sun explode immediately after they collapse, forming supernovae.

A great shock wave, produced by the nuclear force, moves away from the core and collides with matter falling inward at a slower speed. The shock wave produces the heavy elements by rapid fusion, and blows the remaining layers of the star into interstellar space. The Kuiper experimenters have been tracking the newly formed elements in this ejected cloud.

Heavier stars may form black holes upon collapsing, while lighter stars, like the sun, end their lives less violently - as white dwarfs. Before exhausting its fuel, Supernova 1987A spent most of its 10 million years as a hot blue giant in the Large Magellanic Cloud, 170,000 light years away. The Large Magellanic Cloud is the Milky Way's nearest galactic neighbor. At the time of its cataclysmic collapse, the star (catalogued by Sanduleak) was 20 times the mass of our sun.

Stars spend most of their lives fusing hydrogen into helium in their cores. During this long middle age, the star is relatively stable - the inward pull of gravity caused by its immense mass, and the radiant pressure of its core, provided by thermonuclear reactions (fusion), are about equal. After the hydrogen core is completely converted to helium, the newly created helium core temporarily collapses under gravity. If the star is large enough, increased heat and pressure ignite a second stage of thermonuclear production, fueled now by helium.

Helium then burns to carbon and oxygen. During this period, the star's outer surface cools and expands, and the star is declared a red giant. Once helium fusion ceases, contraction occurs again, and the core grows hotter. This process is repeated, forming heavier materials, until iron is produced in the central core.

The protons and neutrons of iron are in the most stable arrangement possible, and at this stage, nucleosynthesis ceases. The iron core is eventually overcome by tremendous forces of gravity - until, at a very small distance, the nuclear force reverses (repels rather than attracts) - and a nuclear bounce and explosion occurs.

The high densities present during the iron core collapse squeeze electrons and protons together to form neutrons. Enormous quantities of invisible neutrinos, emitted in the production of neutrons, were detected in deep underground laboratories during a 10 second period on February 23, 1987.

Kuiper Airborne Observatory Supernova 1987A research is conducted by the Astrophysics Branch in the Space Science Division, and supported by the Medium Altitude Missions Branch in the Science and Applications Aircraft Division at NASA Ames Research Center in Mountain View, Calif.

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December 7, 1988

NASA News

National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

For Release:

Diane Stanley 415/694-5091
Release No. 88-90 IMMEDIATE

NOTE TO EDITORS:

Ames Research Center is managing a major aircraft campaign to investigate ozone depletion in the northern polar region of earth's upper atmosphere. The Airborne Arctic Stratospheric Expedition, January 1 - February 15, 1989, deploys a high altiltude ER-2 and medium altitude DC-8 to Stavanger, Norway for multiple research missions into the arctic vortex.

A press conference will be held December 15, 9:00 a.m., in Bldg. 245, Space Science Auditorium, at Ames Research Center to discuss science and aircraft operations. Interviews with principal investigators and project management teams, and an aircraft photo opportunity are scheduled for 10:00 a.m. at the hangar. Background material, videotape and still photos of the aircraft will be available.

The research expedition addresses the crucial issue of global ozone depletion. A fall 1987 major airborne campaign to the Antarctic region studied the sudden decrease in southern polar ozone (observed since 1979) and provided data implicating man-made chemical compounds, chlorofluorocarbons.

The cooperative program, headed by Dr. Robert Watson of NASA Headquarters and Project Manager, Dr. Estelle Condon, from Ames Research Center, involves more than 200 scientists, technicians, and pilots from the United States and other countries. The NASA managed effort includes the National Oceanic and Atmospheric

Administration, the National Science Foundation, and the Chemical Manufacturers Association.

The ER-2 will make 12 flights at 65,000 feet into the region of expected maximum ozone depletion. The aircraft will fly from the western coast of Norway over the Arctic to about 80 degrees North Latitude and return. To test current chlorine-based theories of ozone depletion, the ER-2 will make measurements of ozone, water vapor, aerosols and other atmospheric chemicals, including chlorine, for 14 experiments. Winds, temperatures, and pressures will also be recorded.

The Ames DC-8, an airborne science laboratory, will carry ten experimental pallets and their supporting scientific teams measuring the distribution of ozone, aerosols and other chemicals, total water vapor and whole air sampling - testing current chlorine-based chemical theories. The greater range of the DC-8 will allow it to search for the northern low temperature vortex, gaining, for scientists in real time, important air samples from the coldest region. Unlike the stable southern polar vortex, the Arctic vortex forms, moves around, and breaks down. Fourteen flights at approximately 40,000 feet are planned.

The aircraft flights are scheduled during the most active period of polar stratospheric cloud formation, associated with cold temperatures important for testing current chlorine-based theories. Ozone production and loss in the northern polar region will be studied, as well as the effect of the Arctic polar vortex on ozone distribution. The experiments are designed to measure existing Arctic ozone depletion and to provide a base of high quality atmospheric data.

This expedition is being conducted by the Earth Systems Science Division and the Science and Application Aircraft Division at NASA Ames Research Center in Mountain View, Calif.

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December 9, 1988

NASA News

National Aeronautics and
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Ames Research Center
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Diane F. Stanley 415/694-5091

For Release:

Release No. 89-02

IMMEDIATE

PLANS FOR STUDY OF COMET SAMPLES IN EARTH LABORATORIES

A sample of a comet nucleus, returned to Earth for study, could help scientists understand the formation of elements in stars, conditions in interstellar space, and the early history of the solar system. A group of international scientists will meet January 16-18, 1989, to discuss these basic questions and the technical problems associated with obtaining and returning the icy sample.

The workshop, "Analysis of Returned Comet Nucleus Samples," is co-hosted by NASA Ames Research Center and the Lunar and Planetary Institute. It will be held at the Embassy Suites Hotel in Milpitas, Calif.

The general sessions of the workshop are open to the media:

SOURCES AND NATURE OF COMETARY COMPONENTS
FORMATION AND PHYSICAL PROCESSING OF COMETS
COMPOSITION OF COMETS FROM SPACECRAFT OBSERVATION
INSIGHTS INTO COMETS OBTAINED FROM ANALYSES OF PRIMITIVE SOLAR SYSTEM MATERIALS
EFFECTS OF ASTROPHYSICAL/CHEMICAL PROCESSES ON COMETARY MATERIALS
ANALYTICAL METHODS FOR STUDY OF COMET NUCLEUS SAMPLES

The laboratory study of comet nucleus material will be made possible by the Rosetta-Comet Nucleus Sample Return mission, one of four major missions in the European Space Agency's Long Term Programme "Horizon 2000." NASA and ESA are now cooperating in the advanced planning stages of this mission.

The interdisciplinary workshop will bring chemists, geochemists, and physicists together with astrophysicists and astronomers to determine how best to study the pristine material and what developments in instruments and methods are needed to maximize the science return.

Studies of meteorites and cosmic dust at Ames Research Center and other laboratories suggest that comet samples will contain star dust, interstellar dust, and material from the origin of our solar system. Results from recent spacecraft studies of Comet Halley's gas and dust indicate that organic and inorganic material will be found in a cometary nucleus.

Scientists liken comet nucleus material to the Rosetta Stone because it is thought to contain material from stars and interstellar dust clouds preceding our solar system, as well as material from the earliest stages of the solar system's formation. This fossil evidence, preserved in the frigid near-vacuum of space, will provide "cosmochemical" clues to the history of our solar system and objects existing before its formation.

The solar system formed approximately 4.6 billion years ago from an interstellar dust cloud that contained material from previous generations of stars. As the interstellar cloud collapsed to form the inner and outer planets, dust in the most distant regions aggregated into icy planetesimals that were ejected into orbits great distances from the Sun. The Oort Cloud of Comets is estimated to be more than 10,000 times farther from the Sun than the planet Pluto.

When perturbed by the passage of other stars or interstellar clouds, comets can be thrown into orbits that carry them closer to the Sun. These small icy bodies, mostly water with dust and rocky fragments, have nuclei of only a few kilometers in diameter. The comet coma, a misty cloud vaporized by the Sun's radiation, can be tens of thousands of kilometers in diameter.

The Analysis of Returned Comet Nucleus Samples workshop is organized by a program committee led by Dr. Sherwood Chang, Chief, Planetary Biology Branch, Space Science Division, Ames Research Center in Mountain View, Calif. and Dr. Lawrence Nyquist of the Solar System Exploration Division, Johnson Space Center, Houston, Texas.

Interested participants can register at the Embassy Suites Hotel in Milipitas, Calif. For further registration information contact LeBecca Turner, 713/486-2158, Lunar and Planetary Institute, Houston, Texas.

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January 9, 1989

NASA News

National Aeronautics and
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Peter W. Waller 415/694-5091

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Immediate

Release No. 89-09

BALLHAUS RETURNS TO AMES RESEARCH CENTER

Dr. William F. Ballhaus, Jr., will return to NASA's Ames Research Center, Mountain View, Calif., and resume his position as center director, effective Feb. 1. Ballhaus had accepted a one-year assignment as acting associate administrator for aeronautics and space technology, NASA Headquarters, which began Feb. 1, 1988. He will continue to serve in this position until a replacement is named.

For the past year, Ballhaus has directed NASA's aeronautics and space research and technology development programs and was responsible for the institutional management of NASA's Ames, Langley and Lewis research centers.

In announcing the reassignment, Dr. James C. Fletcher, NASA administrator, said, "Bill Ballhaus responded to a call to come to NASA Headquarters for a year during a critical period in the agency's history. I express my sincere appreciation to him and his family for what he has contributed toward getting the nation's space program back on track."

Ballhaus served as director of Ames since January 1984. Prior to directing Ames, he served as the center's director of astronautics and as chief of the Applied Computational Aerodynamics Branch. He came to NASA in 1971 when he joined the U.S. Army Aeromechanics Laboratory and was assigned to the Computational Fluid Dynamics Branch at Ames.

Dr. Dale L. Compton, Ames deputy director, has served as acting director of the center during Ballhaus' absence.

1/31/89

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For Release:

Immediate

Release No. 89-11

To Editors:

The probe spacecraft which will make the first entry into the atmosphere of an outer planet is complete. The Galileo Jupiter entry probe is undergoing its final "pre-ship review" at Hughes Aircraft Company, El Segundo, Calif. A news briefing will be held at Hughes at 10:00 a.m. on Tuesday, February 14, to describe the new probe craft and its mission. The real flight hardware will be available for news media viewing and filming.

In addition to the Probe, the Galileo Project will send an Orbiter spacecraft to circle Jupiter for 20 months and return 50,000 high resolution pictures. Galileo is currently the only approved major-scale planetary program, and promises significant results. Launch is October 1989 with planet arrival in December 1995.

Probe science may well hold some surprises about the character of giant Jupiter, its spectacular clouds and atmosphere. The probe spacecraft is half heat shield and will enter at 115,000 mph with deceleration forces of up to 360 times Earth gravity. Its incandescent shock wave will be as bright as the Sun.

The Probe project is managed by NASA's Ames Research Center, Mountain View, Calif. The Probe was built by Hughes. The overall Galileo project is managed by NASA's Jet Propulsion Laboratory, Pasadena, Calif.

- more -

Southern California news reporters may want to attend because of the many local involvements. Since the Probe is a Bay area project, San Francisco area news media may want to make the trip.

Release and fact sheets will be available. For TV, a mission clip plus other graphics, project officials, and the spacecraft are available. For coverage arrangements, phone Ames, 415/694-5091, or Hughes at 213/648-0942. Hughes is just south of Los Angeles International Airport. News media representatives should come to Hughes Gate 7, just south of Imperial Highway on Nash Street. The briefing will begin promptly at 10:00 a.m. Please allow 15 minutes for parking and security.

News briefing and other video will be transmitted on NASA Select on a tape delay basis at 1:00 p.m. PST, February 14. This satellite feed will be available via Satcom F-2R, transponder 13, C-band, 72 degrees W. longitude, 39.60.0 MHz, audio 6.8 MHz.

2/6/89

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Peter W. Waller 415/694-5091
Linda Blum

For Release:

February 14, 1989
10:00 a.m. PST

Release No. 89-12

GALILEO PROBE PREPARED FOR LONGER LIFE

Work to prepare the Galileo Space Probe for a longer lifetime than initially planned has been completed at NASA's Ames Research Center, Mountain View, Calif. The Probe is scheduled to enter Jupiter's "brilliantly-colored" cloud banks in late 1995, becoming the first spacecraft ever to enter the atmosphere of an outer planet.

Age assessment studies have been completed, and tests of the Probe's major operating subsystems began in December, 1988. The Probe now has been reassembled and refurbished at Hughes, after return from storage at NASA's Jet Propulsion Laboratory, Pasadena, Calif., in September, 1986.

Several of the Probe's components were rebuilt to counter potential problems due to aging. Rebuilt parts included the parachute which will slow the Probe as it descends through Jupiter's atmosphere; the lithium sulfur dioxide batteries; and the mortar cartridge, which deploys the pilot parachute. The cost of replacing these parts was roughly $1.5 million, according to Probe manager Benny Chin of Ames.

All seven of the Probe's scientific instruments have been reintegrated onto the Probe, have undergone detailed performance tests, and been found flightworthy.

- more -

All major subsystems have undergone detailed performance tests. They are the telemetry and command system, the data and command processor; the power system; the radio transmitter system; and the pyrotechnic control unit.

Because the Galileo mission has been delayed several times as different launch vehicles and mission plans have been considered, the spacecraft will be 8-years-old at launch in 1989. Chin commented, "With each delay, the risks of the Probe not completing its mission are somewhat greater because of the aging of parts. However, we're confident that we're minimizing that risk as much as possible through our age assessment and testing procedures."

Launch of the Galileo Probe and Orbiter is now scheduled for October 1989. Galileo will follow a complex new flight path to Jupiter to compensate for launch from a less powerful upper-stage rocket than had earlier been planned. The Centaur liquid-fueled, upper-stage rocket program was canceled for safety reasons after the shuttle accident. Galileo will now use the U.S. inertial upper-stage rocket.

The new flight plan, known as the Venus-Earth-Earth-Gravity-Assist trajectory, calls for Galileo to take three energy-boosting gravity assists in the inner solar system. First, Galileo will swing in to Venus in February 1990, to pick up energy from Venus' gravitational field and orbital motion. The spacecraft will then return back to Earth, where it will pick up Earth orbital energy and circle the Sun. It will return to Earth for a second assist before embarking on its final, non-stop trajectory to Jupiter in 1992. The Galileo Probe will be carried to within 48,000,000 miles of Jupiter by the Galileo Orbiter.

When Galileo nears Venus, it will be exposed to greater solar heating than expected by earlier flight plans. Additional insulation is not needed because mission experts will keep Galileo pointed continuously toward the Sun while in the inner solar system. The Probe, located in the rear of the Orbiter, will remain in the shade throughout this phase of the mission, and will stay relatively cool. The Orbiter is now undergoing extensive modification at the Jet Propulsion Laboratory to gain additional

- more -

thermal protection. Only the Probe's radio link antenna, which is located on the Orbiter, will need to be insulated.

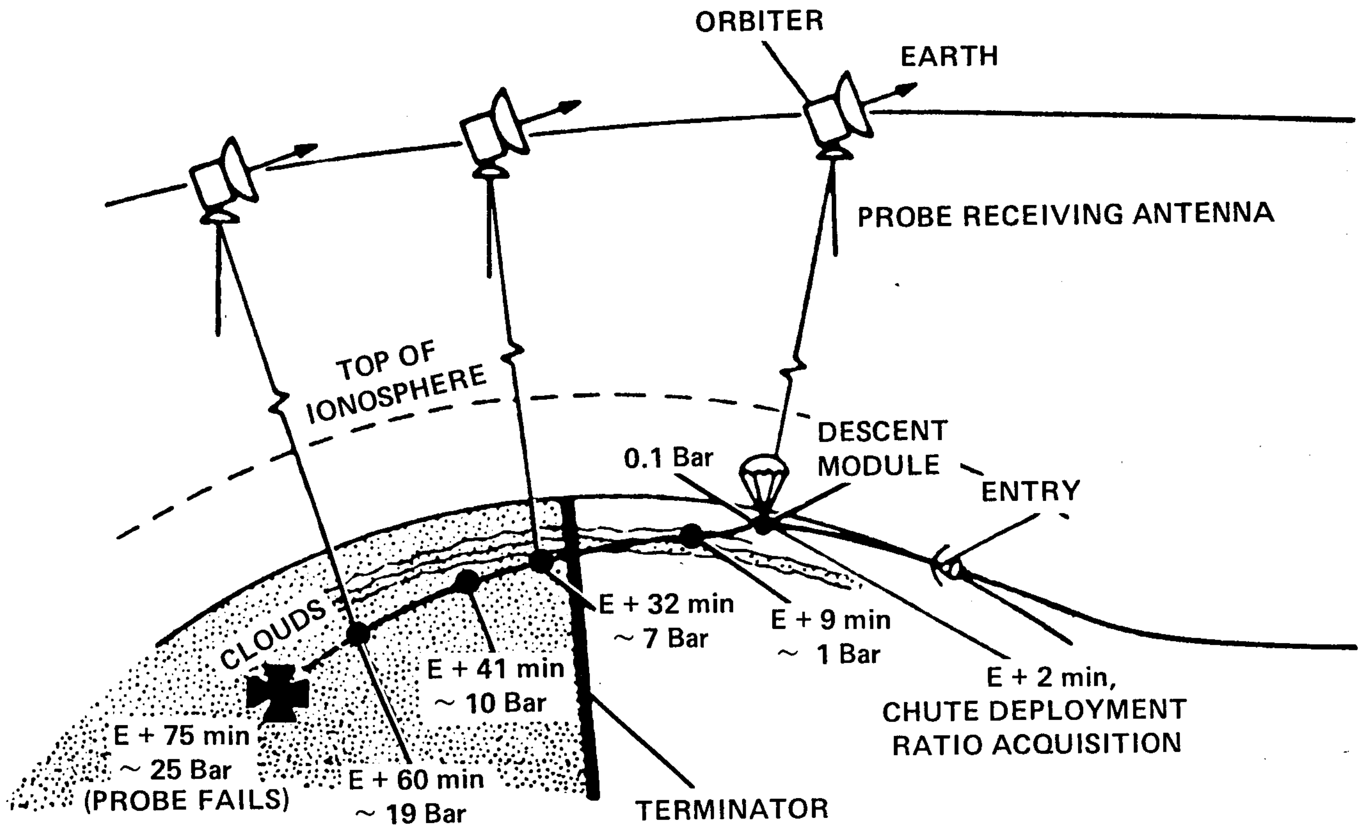
The Probe has been designed to withstand extremely difficult entry conditions at Jupiter. It will slam into Jupiter's atmosphere at 115,000 miles per hour. Deceleration to Mach 1 will take less than two minutes, causing inertial forces, at maximum deceleration, to reach up to 350 times Earth's gravity. The buildup of heat in the gases, in front of the Probe nose cone, will be as intense as a nuclear explosion.

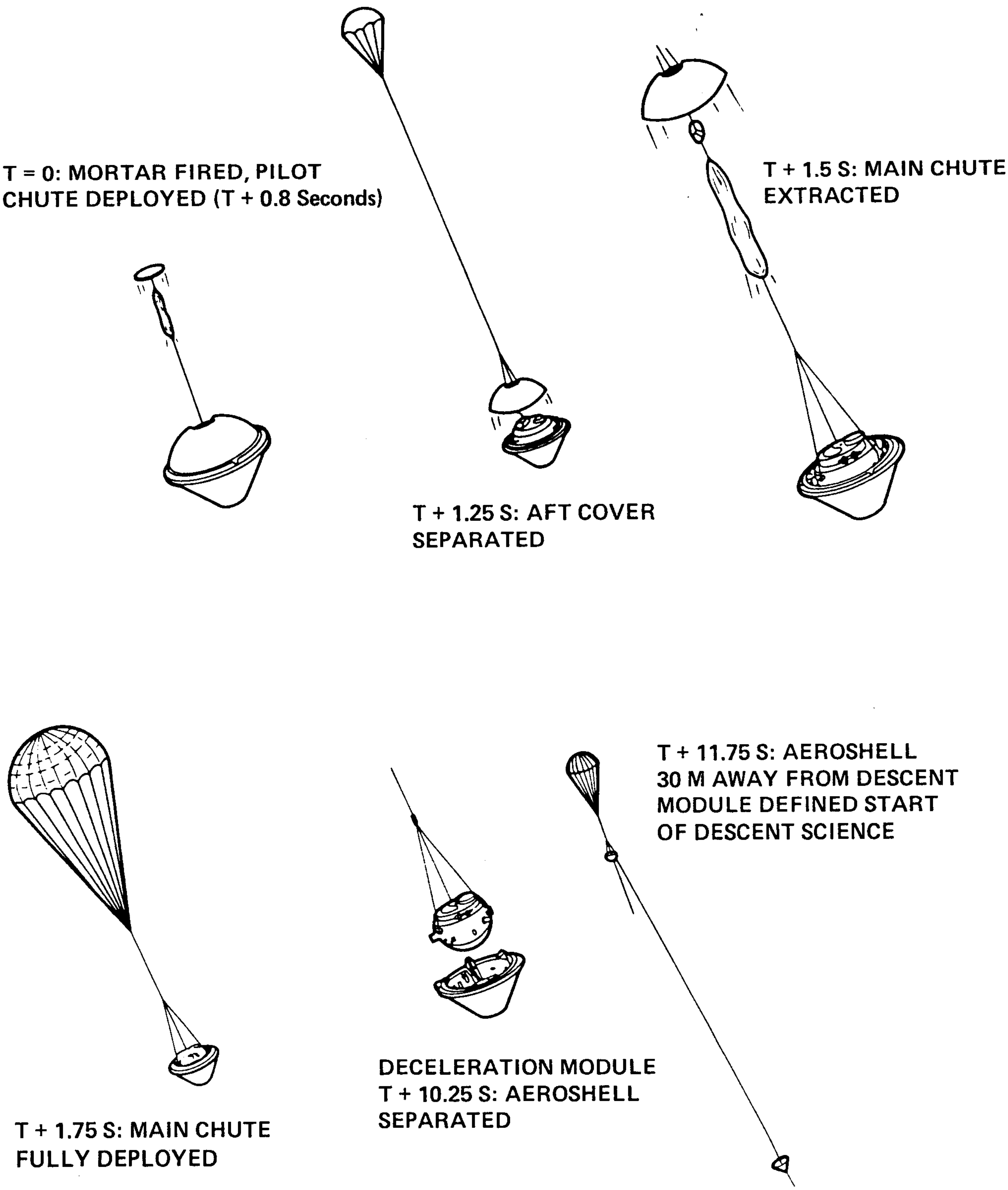
After its fiery entry, the Probe will descend 150 miles through Jupiter's main cloud layers, generating data on the planet's chemical composition, turbulent winds, atmospheric structure, lightning and heat flux. For most of this period, the Probe will operate in a relatively benign environment, immersed in gases at or below room temperature.

Pressures will reach 15-20 times Earth's sea level pressure by the end of the 75 minute Probe mission. Eventually atmospheric pressure will crush the craft.

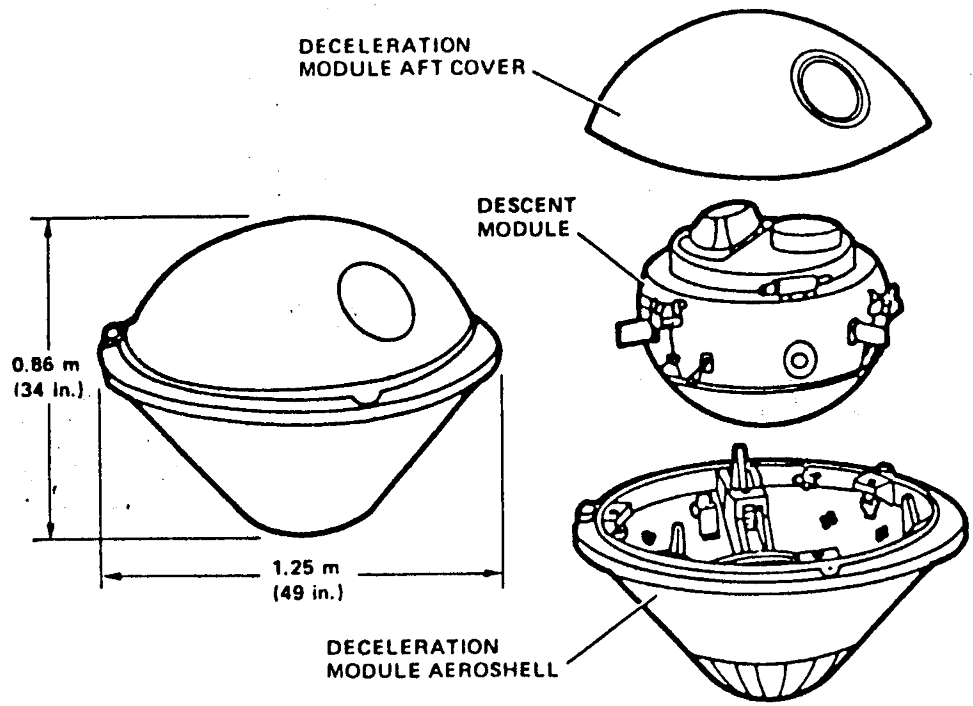
The Probe will separate from the orbiter 150 days before the Probe's entry. The orbiter will continue to function for 22 months, orbiting Jupiter at least ten times and closely studying the giant planet, its major satellites and large magnetosphere.

ORBITER OVERFLIGHT





Deceleration Module Staging Sequence



Probe configuration.

NASA News

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Release No. 89-14

FIRST ATMOSPHERE PROBE CRAFT
FOR AN OUTER PLANET COMPLETE

The Galileo Probe Spacecraft, which will make history's first entry into the atmosphere of an outer planet, has been completed.

The new Galileo probe will accomplish the unprecedented first entry into Jupiter's atmosphere and then fly 400 miles deep into the giant planet's atmosphere. Jupiter entry is by far the most difficult in the solar system because of the planet's huge gravity. The Probe will descend through Jupiter's turbulent and brilliantly-colored cloud layers and pass into the hot, dense atmosphere below.

The new five-foot-diameter probe craft, which is almost half heat shield, will enter Jupiter's atmosphere at 115,000 mph -- fast enough to get from Los Angeles to New York in a minute and a half. Maximum G forces on the vehicle during entry will be 350 times Earth gravity. After entry and separation of spent heat shields, the Probe's parachute-borne Descent Module will study Jupiter's three main cloud layers, encountering hurricane winds up to 200 mph and perhaps heavy rain at the base of the water clouds believed to exist on the planet. Seven instruments will provide the first direct information on the nature of Jupiter's atmosphere and clouds.

- more -

Engineers and project officials from NASA and Hughes Aircraft are giving the new craft final approval at a "pre-ship review" at Hughes, El Segundo, Calif. With completion, the Galileo Probe will go from Hughes to the Jet Propulsion Laboratory, Pasadena, Calif., for integration with the Galileo Orbiter spacecraft which will carry it until five months before Jupiter entry.

The Galileo Probe project is managed by NASA's Ames Research Center, Mountain View, Calif. Hughes Aircraft Co., El Segundo, is spacecraft builder, and the heat shield was developed by General Electric Co., Philadelphia.

Overall manager for the Galileo Project is NASA's Jet Propulsion Laboratory, Pasadena, Calif.

Purpose of the overall Galileo mission is to conduct a comprehensive exploration of the Jupiter system using two vehicles, a long-lived Orbiter and the Probe.

The Galileo Probe will provide the first information by direct measurement on chemical composition and physical state of Jupiter's atmosphere and clouds. All Probe data will be radioed to the Orbiter, flying a parallel course 120,000 miles above, for retransmission to Earth.

The Galileo Orbiter will provide the first long-term, close-up observations of the Jupiter system. The Orbiter will encounter Jupiter's remarkable, planet-sized Galilean satellites repeatedly, typically 100 times closer than did Voyager.

During the 20-month life of its mission, the Orbiter will complete ten orbits of Jupiter. It will return about 50,000 high-resolution pictures of Jupiter and its planet-sized moons, and will make a close flyby of at least one Galilean satellite -- Io, Europa, Ganymede, or Callisto -- on each orbit. Each of the Galilean satellites is a world of its own. Io, for example, has currently active volcanos. Io is believed to be the most active volcanic body in the solar system.

The 2,550 kg (5,622 lb) Galileo orbiter/probe spacecraft will be carried to low Earth orbit by the Space Shuttle in October 1989. It will be launched from Earth orbit by an inertial upper

- more -

stage (IUS). The IUS vehicle is managed by NASA's Marshall Space Flight Center, Huntsville, Ala.

The Galileo Probe will separate from the Orbiter five months before planet-arrival and follow its own trajectory to Jupiter entry. Arrival at Jupiter of both Orbiter and Probe is currently scheduled for December 7, 1995. After entry, the Probe mission will be complete in 60 to 75 minutes, when the Orbiter moves out or range, and conditions in the deep atmosphere exceed Probe design limits. During this data-return period, the Orbiter will be positioned 120,000 miles directly overhead to receive Probe data. Immediately after the end of the Probe data period, the Orbiter will reorient for a close flyby of the planet-sized Io, and Jupiter orbit insertion.

For the mission of the Galileo Probe, science objectives are to characterize Jupiter's atmosphere by determining 1) its chemical composition, including minor constituents, isotopic ratios, and the hydrogen/helium ratio; 2) its density profile from initial detection to mission end; and 3) its temperature and pressure profiles.

The remaining science objectives are 4) to find location and structure of Jupiter's clouds; 5) the atmosphere's radiative energy balance; and 6) existence and characteristics of Jovian lightning.

These atmosphere characteristics will be found by direct measurement from several sensors in the Probe Deceleration Module or from the seven instruments aboard the parachute-borne Descent Module. Measurements should be possible down to at least 20 bars atmosphere pressure (20 times Earth's sea-level pressure) before end of communications. Maximum possible depth before cutoff of radio communication is 25 bars pressure, and 25 km (15 mi) deeper than the planned mission. There the Orbiter must turn away for Io encounter. At this point, the Probe will have operated 75 minutes since atmosphere entry.

Other Probe science will be measurements of Jupiter's numerous radio emissions, characteristics of trapped high-energy particles down to the atmosphere top -- far closer than measured by Pioneer 11's 41,000 km (26,000 mi) closest approach to Jupiter. The Probe will measure wind shears by Doppler radio measurements made aboard the Orbiter.

The Probe Mission has four phases: launch, cruise, coast, and entry-descent. During launch and cruise, the Probe will be carried by the Orbiter, and serviced by a common umbilical. The Probe will be dormant during cruise except for periodic checkouts of spacecraft systems and instruments every 12 months. During this period, the Orbiter will provide the Probe with electric power, commands, data transmission and some thermal control.

Five months before planet arrival in July 1995, the Orbiter will spin up and aim the Probe on its entry trajectory. The spin-stabilized Probe will separate and fly to Jupiter. Six hours before atmosphere entry, the Probe will be going about 65,000 kmh (40,000 mph). At that point, its command unit signals "wake up" and it begins collecting science.

From there it will accelerate steadily until it enters the atmosphere at 185,000 kmh (115,000 mph). The incandescent shock front ahead of its heat shield will be as bright as the Sun.

The shields experience peak heating of 40 kilowatts per square centimeter from the 16,000 degree C (28,000 degrees F) shock wave temperature. Peak G forces occur about two minutes after entry. About four minutes after entry, drogue chute deploys, and aft cover is pulled away. Main chute opens and the Deceleration Module with its massive heat shield falls away. From there on, the Descent Module with its seven scientific instruments moves downward toward the brilliant cloud tops. (See table at end for instrument measurements.)

The Probe's total weight is 331 kg (728 lb). The Deceleration Module, which carries the heat shield and aft cover, weighs 214 kg (470 lb) and the Descent Module, nested inside the Deceleration Module, weighs 118 kg (260 lb). The Descent Module carries 28 kg (62 lb) of scientific instruments.

The 145 kg (319 lb) Probe heat shield is a 45-degree-half-angle blunt cone. It is made of carbon phenolic material.

Probe communications are provided by two L-band transmitters. These can be used to check each other for proper function, and provide two channels for return of data from Jupiter's unknown atmosphere.

Probe power comes from a high-discharge-rate 34-volt lithium battery, which must remain dormant for more than five years, en route to Jupiter.

The Probe's command and data system provides commands, telemetry, data storage, and timing. It uses two redundant data strings each with its own processor.

The Probe Relay Radio aboard the Orbiter will have two redundant receivers which process Probe science data, plus radio science and engineering data for transmission to the Orbiter communications system. The unit must automatically acquire the Probe signal 100,000 miles below within 50 seconds, with a success probability of .995. It must reacquire immediately if the signal is lost. Minimum received signal strength is 31 dB-Hz. The receivers also measure signal strength and Doppler for wind measurements and atmosphere-transmission characteristics.

In addition to processing the Probe data and sending it to Earth in real time, the Orbiter will store it for later retransmission.

PROBE INSTRUMENTS	CHEMICAL COMPOSITION	PHYSICAL STRUCTURE (INDIRECT) 1. DENSITY 2. TEMPERATURE, PRESSURE	CLOUD LOCATION AND COMPOSITION	RADIATIVE ENERGY BALANCE	ELECTRICAL DISCHARGES 1. OPTICAL EMISSIONS 2. RADIO SIGNATURES	ENERGETIC PARTICLE POPULATION
NEUTRAL MASS SPECTROMETER (NMS)	√					
HELIUM ABUNDANCE DETECTOR (HAD)	√					
ATMOSPHERE STRUCTURE INSTRUMENT (ASI)		√√				
NEPHELOMETER (NEP)			√			
NET FLUX RADIOMETER (NFR)				√		
LIGHTNING AND RADIO DETECTOR (LRD)					√√	
ENERGETIC PARTICLE INSTRUMENT (EPI)						√

Galileo Probe science objectives.

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Peter W. Waller 415/694-5091

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Immediate

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GALILEO ATMOSPHERE PROBE

Science Objectives, Instruments, and Experimenters

The science objective of the Galileo Probe mission is to characterize the Jovian atmosphere by determining: 1) the chemical composition, including minor constituents, isotopic ratios, and the hydrogen/helium ratio; 2) the density profile from initial detectable deceleration (first traces of atmosphere); 3) temperature and pressure profiles with altitude; 4) location and particle-size of the Jovian clouds; 5) the radiative energy balance; 6) the existence and characteristics of electrical discharges in the atmosphere at both optical and radio frequencies.

These atmosphere characteristics will be determined by direct measurements to a pressure level of at least 10 bars (10 times Earth surface pressure). In addition, the Probe will measure radio signals from the planet by remote sensing, measure characteristics of trapped particle radiation close to the atmosphere-top before entry. It will determine atmosphere wind shear by Doppler measurements on the Orbiter of the incoming radio signal. The science instrument payload carried by the probe consists of seven instruments.

- more -

Science instrument payload

Device	Institution	Principal Investigator	Primary Measurements
Atmosphere structure instrument (ASI)	Ames Research Center	A. Seiff	Pressure, temperature and density
Nephelometer (NEP)	Ames Research Center	B. Ragent	Cloud particle size, shape, and number density
Helium abundance detector (HAD)	U. of Bonn W. Germany	Ulf von Zahn	He/H_2 ratio to ~0.1%
Net flux radiometer (NFR)	U. of Wisconsin	L. Sromovsky	Net planetary and solar fluxes, cloud locations, water and ammonia abundance
Neutral mass spectrometer (NMS)	Goddard Space Flight Center	H. Niemann	Composition in 1-150 AMU range
Lightning and radio emissions detector (LRD)	Bell Laboratories	L. Lanzerotti	Existence and characteristics of lightning
	Max-Planck Institute W. Germany	K. Rinnert	
Energetic particle instrument (EPI)	U. of Kiel W. Germany	H. Fischer	Energetic particle distribution from 5 Jupiter radii to entry
	Ames Research Center	J. Mihalov	

2/7/89

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Fact Sheet

GALILEO PROBE SPACECRAFT

Mission outline -- The Galileo Probe Mission has four phases: launch, cruise, coast and entry-descent. During launch and cruise, the Probe will be carried by the Orbiter.

The Probe craft will be dormant during the cruise phase except for checkouts at 12-month intervals. During cruise, the Orbiter will provide the Probe with electric power, commands, data transmission, and some thermal control.

After cruise and during the five-month coast phase, the Probe will have separated from the Orbiter, but will remain dormant until atmosphere entry. From the beginning of coast to the end of the mission deep in Jupiter's atmosphere, all probe operations will be controlled by a preset sequence. At separation from the Orbiter, the coast timer is set so that it will start Probe operation and science measurements at six hours before Jupiter entry.

Probe requirements -- The 185,000 kph (115,000 mph) entry velocity at Jupiter has required a new approach to heat shield design. Electronics are redundant throughout the Probe for reliability. Electronics are hardened against Jupiter's intense radiation belts. The Probe power supply (a high-discharge-rate lithium battery) must last six years before use. The antenna and relay

- more -

radio for receiving Probe data aboard the Orbiter are provided by the Probe team. The Probe digital data receiver on the Orbiter will automatically acquire, track, and rapidly reacquire the Probe signal if lost -- from a vehicle deep in a hostile atmosphere. The Orbiter communications system will both return Probe data to Earth as received, and record it for later transmission. The Probe is run by a self-contained and sealed microprocessor-controlled command and data system, which has a redundant, dual-data-string configuration.

The Probe System -- The Probe Spacecraft consists of the Deceleration Module and the Descent Module.

The Deceleration Module includes the heat shield, thermal-control hardware, separation subsystem, and drogue parachute.

The Descent Module is nested into the Declaration Module for protection from the heat of high-speed entry. It carries the science instruments, plus the systems to support the experiments and transmit their data back to the overflying Orbiter for relay to Earth. It will descend on the main parachute 200 miles into Jupiter's atmosphere, after separation from the Deceleration Module.

The Probe's total weight is 331 kg (728 lb). The Deceleration module weighs 213 kg (469 lb), and the Descent Module, 118 kg (260 lb). The Probe carries 28 kg (62 lb) of scientific instruments, all of them in the Descent Module.

As noted, half the Probe weight is in the heat shield. Probe electronics are unusually heavy because they are hermetically sealed to withstand 20 bars of pressure deep in Jupiter's atmosphere.

The entry configuration of the Probe is a 45 degree half angle cone with a base diameter of about four feet. The radius of the spherically-blunted tip is about half the base radius.

The heat shield (by weight, most of the Deceleration Module, and about half the weight of the entire Probe Spacecraft) is a carbon phenolic structure. The aft cover heat shield is phenolic nylon. Heat of Jupiter's unprecedented entry environment will come primarily as radiated heat from the entering Probe's incandescent gas cap. Another factor will be sheer mechanical erosion of heat shield material as the spacecraft strikes the atmosphere at 185,000 kph (115,000 mph).

A major part of the Probe development project was devoted to developing complex computational codes for calculating the level of this severe entry heating in the incandescent shock layer ahead of the Probe (around 16,000 degrees C, 28,000 degrees F).

In addition to these analytical efforts, small scale models of the system were tested in sophisticated arc-jet and laser facilities at Ames, which were developed to simulate these intense environments and associated response of the heat shield. By comparing test results to the calculations, it was possible to develop confidence in the design thickness of the shield (14 inches at the stagnation point). The total weight of the heat shield is 145 kg (319 lb) of which 90 kg (198 lb) are expected to be vaporized by ablation during entry.

Thermal control of the Probe is provided by a passive system of Mylar blankets, plus active one watt radioisotope heaters. Temperatures in the Descent Module during descent must be kept between -20 degrees C (-4 degrees F) and +50 degrees C (122 degrees F).

To minimize electrical charging during passage through the charged particles of Jupiter's radiation belts, surfaces are coated with conducting film and grounded to the Probe structure.

The heat shield and Deceleration Module equipment are mounted to an aluminum frame, supporting an aluminum skin. A radio window is cut in the aluminum for the lightning and radio emission detector experiment (LRD).

<u>Parachute</u> -- Chute deployment occurs when the heat shield has slowed the craft to Mach .9. The pilot chute is fired into the wake by a mortar at 13 kph (70 mph). After this, separation nuts fire to release the aft cover, which in turn pulls out and strips the bag from the main parachute. All this occurs in two seconds.

The Descent Module -- The spherical Descent Module is divided into two sections by a shelf which carries most of the equipment. The scientific instruments are on the aft side of this shelf, with batteries and programmers on the forward side. These heavy components are there to provide proper forward motion while on the chute. Communications and pyro-control are mounted in the compartment aft of the equipment shelf. The main parachute, LRD antenna, and Energetic Particle Instrument (EPI) sensor are on top of the aft compartment. Unlike Pioneer Venus, which used a sealed pressure vessel to withstand Venus's 100 bar pressure environment, the Galileo Descent Module is vented, and individual units are sealed in housings as needed. This design approach saves weight.

The equipment shelf is made of aluminum honeycomb, with other structural components of the Descent Module made of aluminum, titanium, or fiberglass.

The scientific instruments are laid out roughly around the Descent Module's circular interior with their sensors extending through the titanium sheet walls of the Module. They are located to meet specific viewing and flow condition requirements. Each instrument uses one digital line for primary data transfer. In addition, there are six analog and eight bi-level channels, plus nine frame rate and seven clock signals for the instruments.

Thermal control before entry is provided by the Deceleration Module. After separation, temperatures in the vented Descent Module roughly follow that of the Jovian atmosphere. However, Kapton blankets even out temperature differences inside the module.

Probe communications -- This subsystem provides two parallel and simultaneous data streams. These are two L-band channels, one at 1387.0 MHz and one at 1387.1 MHz. Each channel consists of an exciter, a 23 watt power amplifier and, in one case, an ultrastable oscillator; the other a standard thermally-controlled oscillator. The channel with the ultrastable oscillator will be used for Doppler measurement of Jovian winds. The transmitter also measures its own output power level. This measurement, along with a measurement of the received signal strength at the Orbiter relay receiver, is used to find atmospheric absorption. The system antenna has a 56 degree 3 dB beam, and a peak gain of 9.8 dB.

Probe power -- The power subsystem consists of two electronics units, a lithium/sulfur dioxide battery and a set of thermal batteries. The power interface unit is the main power distribution unit. It routes power to the Probe subsystems from either the Probe battery or the Orbiter power supply to Probe subsystems or to the scientific instruments.

Voltage of the lithium battery is 34 volts. Total capacity is 21 ampere hours. Thermal batteries provide pulses for pyrotechnic events.

Command and data system -- This system includes the data and command processor (DCP) and the pyro-control unit. The DCP controls all system command, telemetry, data storage, and timing. It uses two redundant data strings, each controlled by its own microprocessor. Virtually, all post-entry functions are the same on both strings. Pre-entry functions are divided between the two strings and are not redundant. The system's self-test function is activated once, about 20 minutes before entry. If a fault is found on one string, the faulty string will be turned off and remain off.

During the coast phase, only the coast timer operates. During the 6-hour pre-entry period, just one data string gathers LRD AND EPI data. Starting 20 minutes before entry, both strings operate through the end of the mission. The entire operations sequence from separation to the end of the mission is contained in permanent memory.

In case the coast timer fails, timing for entry is tied directly to atmosphere entry via deceleration switches. These will sense the first traces of atmosphere and activate parachute deployment, as well as all subsequent mission events regardless of the coast timer.

The pyro-control unit provides pulses for activating some 48 pyrotechnic squibs on the Probe. The squibs initiate a number of functions such as separations and chute deployment.

Relay radio -- The relay radios aboard the Orbiter receive data from the Probe, descending into Jupiter's atmosphere, 100,000 miles below -- for transmission to Earth by the Orbiter communications system. The system consists of two receivers, ultrastable oscillators, and antenna.

Each receiver acquires, tracks, and processes the Probe data along with radio science and engineering data. The receivers also format data for transmission to the Orbiter command and data system.

The unit must acquire the Probe signal within 50 seconds with an acquisition probability of .995 and with a false-lock probability of .000005. Minimum signal strength at acquisition is 31 dB Hz. The system is required to track a signal strength as low as 26 dB Hz. The unit also measures Probe signal strength and Doppler rates for radio science use (wind and atmosphere absorption measurements).

Meeting these requirements is made difficult by uncertainties in the Probe signal characteristics, and the atmospheric environment. These include frequency and spin-rate, and non-steady motion of the Probe due to wind shear and turbulence, as well as ionospheric scintillation, synchrotron noise from Jupiter's radiation belts, and the absorption of the clouds.

NASA Facts

National Aeronautics and
Space Administration

Washington, D.C.
20546

Peter W. Waller/Diane F. Stanley
Ames Research Center, Mountain View, Calif.
(Phone: 415/694-5091)

August 1989

FACT SHEET

NASA AMES MARKS 50 YEARS OF SPACE AND AVIATION ACHIEVEMENTS

This year, NASA's Ames Research Center, Mountain View, Calif., marks 50 years of contributing major advances to U.S. spaceflight and aviation -- advances such as solving the problems of atmosphere reentry from spaceflight, exploring Jupiter, searching for life on Mars, designing runway-to-orbit flight vehicles and listening for messages from extraterrestrials.

Aerodynamics

In 1952, theoretical aerodynamicist Harvey Allen discovered a method to return vehicles like the Apollo mooncraft and ballistic missiles into the atmosphere from space. Allen later became Ames' director.

By 1958, a group of Ames researchers including Dean Chapman, Clarence Syvertson and Alfred Eggers determined how to use aerodynamic lift to fly space vehicles, some of them known as "lifting bodies," back through the atmosphere to a safe runway landing. This pioneering work paved the way for the Space Shuttle.

As early as 1951, Robert T. Jones, who had previously developed the mathematics for designing the swept-back wings found on most of today's aircraft, performed the calculations which resulted in the "supersonic area rule." This research allowed minimum drag for subsequent supersonic aircraft.

In 1976, Jones devised the revolutionary oblique wing -- an entirely rigid, straight wing which rotated horizontally around its center to provide a wing-sweep capability -- with one wing swept forward and the other swept aft at an angle to the aircraft's fuselage.

- more -

Test Flying by the Numbers

In the 1980s, Ames researchers began "flying" aircraft in the world's fastest supercomputers, obtaining research results directly -- by watching the "real" air flow, calculated at a billion computations per second, on television screens.

Often these designs are for aerospace craft so radical that they cannot be tested in existing wind tunnels. At speeds higher than 13 times the speed of sound, this computational flight is the only kind of advanced testing available.

Supercomputer techniques will improve many areas of aircraft design. But immediately and dramatically, they are essential for the planned National Aero-Space Plane, an advanced Space Shuttle that could take off from conventional runways, fly into space and return to Earth like an airplane.

Tilt-Rotor Research

In 1981, building on previous Ames work with the XV-3 and other industry research, Ames' engineers developed an unusual type of aircraft. The XV-15 tilt-rotor could take off or land vertically like a helicopter, then fly conventionally for 500 miles at over 300 mph. This craft evolved into today's thousand-range V-22 Osprey, carring 33 passengers. The Osprey and similar tilt-rotors have great promise for efficient commercial transportation in congested air traffic areas, operating from very small platforms for landing and takeoff.

The tilt-rotor, along with a range of powered-lift configurations from both subsonic to supersonic speeds, is representative of Ames' involvement in vertical and short takeoff and landing craft research which began in 1960.

Life Sciences and Human Factors Research

Scientists at Ames made the first attempts to find life on Mars in 1976. Harold Klein, Ames' long-time director of life sciences, presided over development of the life-detection experiment mounted on the Viking 1 and 2 landers.

As part of the center's planetary research, life scientists also have sought to trace the assembly of life's chemical building blocks on the primitive Earth. Typical of a long series of origin-of-life experiments was the finding in 1970 of the nine "life" amino acids in a meteorite believed to have come from the Asteroid Belt. Another was the discovery of some of the earliest life forms in 3.2 billion-year-old South African shales.

Since the late '60s, Ames' space medicine researchers have been seeking to determine whether humans can tolerate the lengthy space flights required aboard Space Station Freedom or for a 2-year round-trip to Mars.

Ames was given responsibility for NASA's basic research in life sciences in 1961. From 1966 to 1969, Ames' series of Biosatellites carried eggs, plants and insects into orbit and returned them to Earth, investigating a range of weightlessness effects on living systems. Center life sciences and human factors work has evolved into the Spacelab manned biology missions carried aboard the Space Shuttle. Similar labs are planned for Space Station Freedom.

Ames' Space Station work includes a variety of automated, "smart" systems with applications in artificial intelligence, expert systems and free-flying robotics. Other station developments include a durable space suit, the AX-5 "hard-suit" design, a concept begun in 1965. Researchers also are working on closed life support systems and long-term habitability problems for Space Station Freedom.

Airborne Astronomy

Since 1965, when Ames acquired a Convair 990 transport named "Galileo," airborne science at the center has made a number of important discoveries. In the early '70s, an Ames U-2 made one of the first measurements of "big bang" radiation left over from formation of the universe. In March 1977, scientists using the 36-inch infrared telescope aboard a converted C-141 called the Kuiper Airborne Observatory, discovered Uranus' rings. Earlier they had discovered that the prime ingredient in Venus' brilliant clouds was sulfuric acid.

The Kuiper's sensitive instruments have measured a possible black hole in the galactic center and observed star formation. Ames researchers also have flown aboard the Kuiper to obtain a wealth of data on the historic 1987 supernova, watching as the "blue giant" star came apart, step-by-step.

During the last two winters, Ames' scientists and high-altitude aircraft made the first measurements of ozone depletion in both of Earth's polar regions and identified the critical mechanisms in thinning of Earth's protective ozone layer.

The Space Shuttle

In 1974, Ames began work on the thermal protection system for the Space Shuttle, an outgrowth of its work on heat shield designs for vehicles which experienced intense heating during re-entry from space. This project produced the lightweight tiles and other materials which protect the Space Shuttle during its fiery return through the atmosphere.

Astronomy from Orbit

As part of its tradition in airborne infrared astronomy, Ames built the telescope for the Infra-red Astronomical Satellite (IRAS) in 1977.

IRAS conducted the first whole-sky survey in infrared light and was good for seeing "cool" objects like solar systems, asteroids, brown-dwarf stars and interstellar gas clouds.

In 1984, NASA Headquarters and Ames selected investigators and a science team for the Space Infra-red Telescope Facility (SIRTF), one of NASA's space-based "great observatories." SIRTF, scheduled to fly in 1998, will be a thousand times more sensitive than IRAS.

Space Science

In space science, Ames is an international leader. Researchers have made major discoveries about formation and characteristics of stars and planets.

Ames' scientists have developed computer modeling of galaxy dynamics and collisions. Planetologist Ray Reynolds, whose interests cover all planets, predicted volcanos on Jupiter's moon, Io, well before the Voyager spacecraft arrived to photograph these incredible fountains. James Pollack explained Venus' greenhouse effect and proposed that early oceans once existed on Earth's twin planet.

Ames has provided scenarios for formation of all the terrestrial and gas giant planets of the Solar System, as well as developing a comprehensive atmospheric circulation model for Mars and models for all planets with atmospheres.

In 1973, Ames' unmanned Pioneer 10 spacecraft returned the first close-up pictures and first scientific measurements of the planet Jupiter. Researchers repeated the feat at Saturn with Voyager 1 in 1979.

Beginning in 1978, a Pioneer orbiter and probes made the first maps of Venus and sent back several thousand pictures of the cloud-shrouded planet. And in 1983, Pioneer 10 made the first flight out of the solar system and is now 4.4 billion miles away, the most distant human-built object from Earth. Even at the speed of light, Pioneer's radio signal takes an incredible 6 hours to reach Earth.

In 1981, construction began on the Galileo probe spacecraft, scheduled to make the first entry into the atmosphere of an outer planet -- Jupiter. Entry speed will be 115,000 mph, with forces of 350 g. The probe then will penetrate 500 miles into the Jovian atmosphere. Galileo is set for launch by the Space Shuttle orbiter Atlantis in October 1989.

Finally, in 1983, Ames began the Search for Extraterrestrial Intelligence (SETI) program, led by Barney Oliver. SETI uses existing telescopes to listen for radio signals from other intelligent species in our galaxy. So far, no word from out there.

Unique Facilities

A major part of Ames history has been its development of unique research facilities. In 1944 under the leadership of Smith J. (Smitty) De France, Ames' first director, engineers completed the world's largest wind tunnel, having a 40- by 80-foot test section. De France was a man of great breadth and directness who gave the center much of its character and diversity.

The "40 by 80" was big enough to test a fighter aircraft with engines running. In 1987, the tunnel, still the world's largest, was doubled in size with the addition of a second 80- by 120-foot test section, big enough for a medium transport, such as a Boeing 737. Tunnel power was increased almost four times to 135,000 horsepower.

Beginning in the 1960s, Ames also developed the fastest high-speed flight research tunnels; one reached 34,000 mph, 9,000 mph faster than Earth escape velocity. Models of the Mercury, Gemini and Apollo spacecraft flew in these tunnels. More recently, Ames engineers have used them to test the probe vehicle for NASA's Galileo mission to Jupiter, slated to make the most difficult entry ever into a planetary atmosphere.

In addition to these hypervelocity tunnels, 30 other Ames wind tunnels have been built over the years. They cover all speed ranges: subsonic, transonic, supersonic and hypersonic. Ames' unique flight simulators employ multi-story, motion-generating machines, which move three-man cabs about as though they were in real flight.

Ames' Numerical Aerodynamic Simulation supercomputer system is the world's most advanced with plans for the speed of its central processor to reach a trillion computations per second by the turn of the century.

Perhaps most important of these unique facilities is the 65-square-mile Rogers dry lakebed in the Mojave Desert, largest airfield in the world with nearly 365 days of clear flying weather. This is the site of the Ames-Dryden Flight Research Facility, where NASA's Space Shuttle can make its safest landings on 7-mile-long runways, and a variety of radical craft, from lifting bodies to rocketplanes to the forward-swept-wing X-29, have been tested.

In 1981, the Dryden facility, until then an independent NASA center, was merged with Ames. By 1989, Ames Research Center had grown to around 5,000 employees, with 944 acres at two locations, and facilities with a replacement value of $3 billion.
The Early Years

Ames was the second center founded by NASA's predecessor, the National Advisory Committee for Aeronautics. With World War II looming, the country needed an additional aeronautical research facility. Groundbreaking for the Ames Research Center took place on Dec. 20, 1939 at Moffett Field, Calif., 45 miles south of San Francisco, a site which offered good flying weather year-round. Between 1941-1945, Ames' staff of young engineers made essential aerodynamic "fixes" in bombers and fighters, such as the P-51 Mustang, critically needed for the war effort.

With passage of the Space Act in 1958, NACA was transformed into the National Aeronautics and Space Administration, and Ames became a NASA center.

Over the years, Ames has contributed to the highlights of NASA history with a record of accomplishments in science, research and development.

- end -

NASA News

National Aeronautics and Space Administration

Ames Research Center

Dryden Flight Research Facility
P.O. Box 273
Edwards, California 93523
AC 805 258-8381

RELEASE NO. 89-17 FOR RELEASE: IMMEDIATE

Nancy Lovato
(805) 258-8381

VIEWING AREA NOT AVAILABLE FOR SHUTTLE LANDING

Space Shuttle Mission STS-28 is now scheduled for launch on August 8, 1989. Landing is planned for Edwards Air Force Base, California, however, since the flight is a classified Department of Defense mission no viewing site will be available.

Access to Edwards Air Force Base will be restricted to official business only during landing operations. There will be no guest access nor will usual NASA tours be held during that period.

The STS-28 landing time will not be announced until 24 hours prior to landing.

NASA officials expect the East Shore Viewing Site to be open for the following Space Shuttle mission, STS-34, now scheduled for an Edwards landing in October 1989.

-NASA Ames-Dryden-

August 1, 1989

NASA News

National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

Peter W. Waller 415/694-5091

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Time Line

GALILEO ATMOSPHERE PROBE SPACECRAFT MISSION

Launch	Orbiter/Probe spacecraft carried to Earth orbit by Shuttle. After two orbits (3 hours) Inertial Upper Stage (IUS) launches Galileo to Jupiter.
Launch to Entry (E)-150 days	Cruise phase with Probe mated to Orbiter * Periodic commands from Orbiter to Probe * Telemetry from Probe to Orbiter relay receiver * Probe system/instrument checkout every 12 months, relayed to Earth by Orbiter radio
E-150 days	Probe is switched to internal power. Coast timer clock is set. Orbiter/Probe spacecraft spins up to 10 rpm. Spin axis is lined up precisely with Probe trajectory. Separation is commanded from the Orbiter and cable cutters cut the Orbiter/Probe umbilical. Pyrotechnics release hold-down clamps, and three springs push the spinning Probe away. Probe separates and begins 150-day flight to Jupiter entry. No radio transmission from Probe until entry at Jupiter Orbiter then does burn to reach position for receiving Probe signals at entry

- more -

E-150 to E-0 days	Probe coast phase. Operation on internal power (lithium battery). No radio transmission
E-17 hours	Ring plane crossing at 20 Jupiter radii
E-6 hours	Coast timer initiates Probe operation. (Deceleration switches are back-up for timer malfunction) Internal commands: 1) Battery activation, 2) Energetic Particle Instrument (EPI) biased for operation, 3) Stable oscillator warmed up
E-6 hours to E-.8 hours	Flight from 8 to 2 Jupiter radii -- Pre-entry data storage begins and runs to E+122 seconds
E-2.9 hours to E-.8 hours	Flight from 5 to 2 Jupiter radii -- Passage of Jovian magnetosphere. Turn on: 1) Lightning and Radio Detector (LRD), 2) Energetic Particle Instrument (EPI)
E-.5 hours	Altitude 2,000 km (1,240 mi).* Atmosphere Structure Instrument (ASI) data start. Provides deceleration data from which upper atmosphere density may be found

* Altitude zero-point located at atmospheric pressure point of 1 bar (normal Earth surface pressure)

E-0 to E+2 minutes	From 450 km (280 mi) to 50 km (30 mi). Probe entry. Region of intense heat and deceleration. Entry trajectory angle - 8.6 degrees. Entry point 5 degrees south of Jupiter equator, near boundary of south equatorial belt, 18 degrees of longitude from terminator (day-night line)
	Heat shield loses about 100 kg (220 lbs) of mass during entry heating. Seen from nearby would be as bright as the Sun. Radiation emitted from incandescent shock layer around Probe 16,000 degrees C (28,000 degrees F)
	Spacecraft slows from 185,000 kph (115,000 mph) to 160 kph (100 mph). G forces on Probe 250 G (345 G maximum)
	ASI data taking continues
E+35 seconds	Altitude 185 km (115 mi). Atmosphere pressure .00025 bar, atmosphere temperature -104 degrees C (-155 degrees F)
	Begin main heat pulse, heat shield ablation
	ARAD sensors begin measurements, mass loss of heat shield
E+55 seconds	End main heat pulse and heat shield ablation
E+60 seconds	Peak G forces (nominal 250 G, maximum 345 G) Pressure .001 bar, temperature -134 degrees C (-210 degrees F)
E+80 to E+109 seconds	Deployment algorithm begins Deceleration Module staging
E+111 seconds	Speed Mach 1, fire mortar for drogue chute deployment
E+113 seconds	Aft heat shield separates, pulls out main chute
E+117 seconds	Main chute deploys. Altitude 50 km (31 mi)

E+120 seconds	Aeroshell (forward heat shield) separates, with firing of three separation bolts, falls away as chute slows Descent Module to terminal speed, 110 mph
E+122 seconds	Start Neutral Mass Spectrometer (NMS) sequence, deploy Nephelometer (NEP) sensor. (Nephelometer measures cloud particles.) Descent science operational Pressure .1 bar; temperature -152 degrees C (-240 degrees F); altitude 48 km (30 mi)
E+2 to E+75 minutes	Descent science. Six of seven instruments take data. Direct atmosphere measurements Real-time radio transmission of Probe data to overflying Orbiter, which serves as link to Earth. Previously stored EPI and ASI data interleaved with new data. Relay radio receiver and antenna located on Orbiter, part of Probe system, frequency 1387.0 MHz. Radio must acquire Probe signal in 50 seconds maximum, reacquire signal immediately if lost. Instruments on: 1) NMS, 2) Helium Abundance Detector (HAD), 3) ASI, 4) NEP, 5) Net Flux Radiometer (NFR), 6) LRD Maximum time to end of Probe mission (end of communications with Orbiter, due to reorientation for Io passage) E+75 minutes
E+3 minutes	Altitude 30-40 km. Pressure .2 to .8 bar Enter ammonia clouds,** a haze of white crystals. Jovian winds at various altitudes may be up to 335 kph (210 mph)
E+9 minutes	Altitude 0 km. Pressure 1 bar (Earth surface pressure). Temperature -107 degrees C (-160 degrees F)

** Exact altitude of cloud layers not well known

E+9 minutes to E+18 minutes	Pressure 1-4 bar. Enter ammonia hydrosulfide clouds, thought to be there, a brownish smog, denser than ammonia clouds
E+18 minutes	Enter top of water clouds (highest layer ice crystals). This is a very heavy cloud, denser than Earth water clouds. The lower part 4 to 5 km (2.5 to 3 mi) deep may have heavy rain. This region also probably has intense lightning. With high-velocity Jovian winds, clouds may move and change very rapidly.
E+23 minutes	Spacecraft crosses the terminator to the night side of the planet. Night is preceded by 10 minutes of twilight and sunset. Passage of lower water clouds in darkness, probably heavy rain
E+32 minutes	Bottom of known cloud deck. Enter clear, hot atmosphere in the dark. Pressure 7 bar (7 times Earth surface pressure). Temperature 32 degrees C (90 degrees F) Altitude -75 km (-47 mi)
E+41 minutes	Pressure 10 bar. Temperature 62 degrees C (145 degrees F) Altitude -91 km (-57 mi)
E+60 minutes	End of reference mission. Pressure 19 bar. Temperature 127 degrees C (260 degrees F), well above boiling point of water Altitude -126 km (-78 mi)

E+75 minutes

End of Probe data reception. Orbiter must reconfigure from radio relay orientation for Io flyby and orbital insertion burn.

Combination of pressure and temperature on Probe systems, limited battery capacity plus difficulty of radio signal transmission through dense atmosphere and clouds will likely lead to degraded Probe operation in any case.

Pressure 25 bar. Temperature 168 degrees C (335 degrees F)

Altitude -150 km (-93 mi)

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Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

C. J. Fenrick 415/694-5091

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Release No. 89-18

NOTE TO NEWS EDITOR:

JOINT U.S./SOVIET BIOSCIENCE RESULTS REVIEWED;
SOVIETS AT AMES; FUTURE COLLABORATIVE MISSIONS PLANNED

At a briefing scheduled on Thursday, February 16, 10:00 a.m. PST, scientists at NASA's Ames Research, Mountain View, Calif., will announce summaries of the scientific results from U.S. cooperative experiments on the Soviet Cosmos 1887 biosatellite mission. A Soviet scientist will discuss Soviet summary results. The joint activities are being conducted under the 1987 U.S.-U.S.S.R. Agreement concerning Cooperation in the Exploration and Use of Space for Peaceful Purposes.

Collaborative use by the U.S. of Soviet biosatellites and the results of analyzing mammalian biospecimens suggest that adolescent vertebrate animals in prolonged space environment will experience significant adverse physiological and biomedical changes.

Eugene Ilyin M.D., Director of Cosmos Biosatellite Program, for the Institute of Biomedical Problems, Ministry of Health, Moscow, U.S.S.R., will be the Soviet spokesman.

NASA-Ames Research Center's Rodney W. Ballard Ph.D., Cosmos Project Scientist and Assistant Chief of the Space Life Sciences Payloads Office, will conduct the briefing. Richard E. Grindeland Ph.D., Cosmos 1887 Biospecimen Program Manager, will present summary U.S. final science results.

- more -

Video clips and an additional news release will be handed out at the news briefing.

This event will be broadcast on NASA Select television starting at 10:00 a.m., February 16. Stations, cable systems, and others can pick the programming off the satellite (Satcom F-2R, transponder 13, C-band, 72 degrees W. longitude, 3960.0 MHz, vertical polarization, 6.8 MHz audio).

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2/10/89

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Space Administration
Ames Research Center
Dryden Flight Research Facility
P.O. Box 273
Edwards, California 93523
AC 805 258-8381

RELEASE NO. 89-19

FOR RELEASE: IMMEDIATE
(ALSO RELEASED BY NASA'S
KENNEDY SPACE CENTER, FL)

Lisa Fowler
Kennedy Space Center, Fla.
(Phone: 407/867-2468)

Nancy Lovato
Ames-Dryden Flight Research Facility, Edwards, Calif.
(Phone: 805/258-8381)

EDITORS NOTE: STS-34 NEWS MEDIA ACCREDITATION

NASA is accepting accreditation requests for news media to cover the Space Shuttle Atlantis mission (STS-34), currently targeted for launch no earlier than October 12.

All news organizations wishing to send representatives to cover STS-34 must send a letter requesting accreditation for the mission. Previous requests for credentials do not apply to subsequent missions and new letters must be submitted.

Requests for credentials, launch through landing, should be submitted to:

NASA John F. Kennedy Space Center
PA-PIB/Accreditation
Kennedy Space Center, FL 32899

Please indicate the NASA location(s) from which you plan to cover the mission. Media planning to cover the landing only should submit their requests for accreditation to:

NASA Ames-Dryden Flight Research Facility
Attn: DXI/Public Affairs
P.O. Box 273
Edwards, CA 93523

-more-

Requests for accreditation must be made by a supervisory official other than the applicant on company letterhead, clearly indicating the assignment (reporter, photographer, technician, etc.) and social security number of each individual. Freelance writers and photographers must offer proof of assignment or evidence of past professional activity. The accreditation will be valid for all NASA news centers.

NASA ground rules for newspersons covering the mission are:

o NASA can make no travel or housing arrangements.

o Only working newspersons will be accredited at the news centers. Publishers and other news and advertising executives will not be accredited. These individuals should apply to NASA Public Services Division (LP), NASA Headquarters, Washington, D.C., 20546.

o Friends, dependents or relatives not covering the mission will not be accommodated.

o No one under 16 years of age will be allowed at the press site under any circumstances. Violation of this rule will result in cancellation of press site priveledges for responsible parties.

o Philatelic publications must meet the criteria for general publications or be national publications of recognized philatelic organizations. Representatives of catalogs, newsletters, local clubs or profit seeking projects will not be accredited. Conducting philatelic business, other than reporting, is not permitted.

o College news media are limited to two accredited correspondents.

o You must present your letter of acceptance and a photo identification to obtain a news media badge at the appropriate center.

o Violations of the rules will result in loss of press badge and press site privileges.

-end-

September 11, 1989

NASA News

National Aeronautics and
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Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

C. J. Fenrick 415/694-5091

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February 16, 1989

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NOTE TO NEWS EDITOR: RESULTS OF COSMOS MISSIONS AND PLANNED FUTURE U.S.-U.S.S.R. MISSIONS ANNOUNCED

The science results of the collaborative U.S.-U.S.S.R. biosatellite mission from Cosmos 1887 confirmed the adverse physiological and biomedical effects of prolonged space flight. The analyzed mammalian biospecimens suggest that adolescent vertebrate animals will experience significant alterations in calcium metabolism, immune functions, and musculoskeletal mass and structure. The implications of long-term space flight are an animal with weakened muscle and brittle bones in the appendages.

The Soviet Union launched Cosmos 1887, the sixth in a series of unmanned Soviet satellite that flew U.S. and U.S.S.R. life sciences experiments on a 12 plus day mission, September 29, 1987. This cooperative activity is being carried out under the 1987 U.S.-U.S.S.R. Agreement concerning Cooperation in the Exploration and Use of Outer Space for Peaceful Purposes.

The U.S. experiments on Cosmos 1887 were to investigate the effects of space flight on the major body systems, including skeletal bones and muscles, the nervous system, heart, liver, several glands and blood. Special tissue culture studies using pituitary cells studied growth hormone. Spleen and bone marrow cells were used to investigate the effects of microgravity on the immune system. The U.S. also had a radiation measurement experiment on the spacecraft.

- more -

The Soviet experiments were developed and managed by the Institute for Biomedical Problems in Moscow. The U.S.S.R. provided to the U.S. tissue samples from five of 10 rats that were flown up to 12 plus days aboard the spacecraft. The majority of the scientific specimens were returned to the U.S. in late October 1987 and distributed to the scientific teams around the country. The remainder of the biosamples arrived at Ames for analysis in early November.

The science results of Cosmos 1887 experiments were exceptional. In particular, bone studies indicated structural changes occurred without significant changes in the mineral content. For example, the bending strength of the rat humerus bone was decreased by 40 percent and the compression strength of the lumbar vertebra was decreased by 27 percent. Muscle studies on the rats showed that while individual muscle weights were similar for both flight and ground control animal groups, the fast muscle types showed significant decrease in cross-sectional area, atrophy, and extracellular edema, while at the same time showing increased necrotic fibers and motor end plate degradation. Slow muscle types showed little evidence of atrophy but some biochemical changes. The mitochondria in the heart muscle also showed degeneration and fiber changes. Observations on other body organs and physiological systems were made. They confirmed previous flight research experiments, such as a decreased mass and spermatogenesis in the testes; decreased growth hormone release by the anterior pituitary cells, increased cholesterol, triglycerides and organ weight in the liver, and a reduced immune response suggested by several types of measures involving the spleen, bone marrow and blood.

The U.S. Space Biology and Medicine program has received many benefits from scientific cooperation with the U.S.S.R. In particular, this includes the opportunity to conduct experiments on the physiological effects of 12 plus days of space flight on rats and Rhesus monkeys. This length of the Cosmos missions is approximately twice the exposure time in microgravity that is presently experienced in U.S. Spacelab flights on the Shuttle.

While a comparable 8 day U.S. mission is expected to fly in mid-1990 with rats, a U.S. mission with Rhesus monkeys is not expected until late 1992 or 1993. These early Cosmos flights serve as a testbed for the development of U.S. scientific experiments, technology and flight hardware. In addition, both sides benefit from the sharing of research data in all areas of Space Biology and Medicine.

The U.S. has three opportunities to fly experiments with the Soviets in the next few years. The U.S.S.R. has invited the U.S. to participate on the U.S.S.R. 1989 and 1991 biosatellite missions. The science focus will be in biomedical research with the following as payload specimens: Rhesus monkeys, male Wistar rats, fish, fish eggs, newts, drosophila, beetles, seeds, unicellular organism, and planaria. In reciprocal fashion, Soviet scientists have been invited to participate in analysis of specimens from the U.S. Shuttle Spacelab Life Sciences mission to be launched in June 1990.

U.S./COSMOS 1887 MISSION OVERVIEW

DISCIPLINE AREAS: Calcium metabolism, immunology, muscle and bone biochemistry and histology.

PRELIMINARY SCIENTIFIC RESULTS

A 50 percent reduction in bone marrow immunogenic cells was observed postflight.

Growth hormone production by pituitary cells was reduced by 50 percent postflight.

A marked atrophy of leg muscle (>50 percent) was observed postflight.

A marked weakening of the humerus (foreleg) was observed postflight.

NASA News

National Aeronautics and
Space Administration
Ames Research Center
Dryden Flight Research Facility
P.O. Box 273
Edwards, California 93523
AC 805 258-8381

RELEASE NO. 89-20 FOR RELEASE: IMMEDIATE

Nancy Lovato
(805) 258-8381

VIEWING AREA AVAILABLE FOR SHUTTLE LANDING

The East Shore Viewing Site at Edwards Air Force Base, California, will be available for viewers wishing to observe the landing of the Space Shuttle Atlantis, mission STS-34, now scheduled for approximately 1:15 p.m. PDT on October 17, 1989, according to officials at NASA's Ames-Dryden Flight Research Facility at Edwards.

Vehicle passes are not required for the East Shore Viewing Site. The viewing site officially opens 24 hours prior to landing. Access to this site will be closed one hour prior to landing.

Normal access to Edwards Air Force Base will be restricted to official business only.

Viewers should follow news reports for any possible change in the landing date or location. Up-to-date landing information may be had by calling (805) 258-3520.

The East Shore Viewing Site offers an unobstructed view of the shuttle landing. Parking is on unprepared surfaces. Water and restrooms are available. Food and souvenir vendors are expected to be at the site.

Access to the viewing site is via secondary roads, and there may be congestion. There are two access routes to the East Shore Viewing Site.

Those traveling from the Los Angeles area should go north on the Antelope Valley Freeway (Highway 14), turn right (east) on the Avenue F off-ramp, then left (north) on Sierra Highway to Avenue E, right (east) on Avenue E to 120th Street, then left (north) on 120th to Avenue B, turn right (east) and Avenue B curves into Mercury Boulevard, which leads into the viewing area.

Those entering from Highway 58 should take the Rocket Site Road off-ramp to Mercury Boulevard, which leads into the viewing area.

-NASA Ames-Dryden-

October 4, 1989

NASA News

National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

For Release:

Diane F. Stanley 415/694-5091

IMMEDIATE

Release No. 89-20

ARCTIC OZONE INVESTIGATIVE FLIGHTS SUCCESSFULLY COMPLETED

NASA Ames Research Center's ER-2 and DC-8 aircraft have successfully completed the airborne campaign to study ozone distribution and atmospheric chemistry in the northern polar stratospheric environment. High altitude ER-2 flights and scientists aboard the DC-8 flying laboratory have obtained key data for understanding the photochemistry and dynamics that control ozone distribution in the arctic winter.

A press conference will be held February 17, 9 a.m. PST, Bldg. 245, at Ames Research Center in Mountain View, Calif. Results will be announced by Ms. Estelle Condon, Science Project Manager, and Dr. Brian Toon, DC-8 Flight Scientist. Aircraft operations will be summarized by Mr. Don Anderson, DC-8 Operations Manager.

The Airborne Arctic Stratospheric Expedition concluded its Stavanger, Norway deployment on February 15. An international effort, it involved almost 300 staff and a dozen research organizations. Sixteen research flights were conducted by the DC-8. Fifteen research flights were flown by the ER-2, many successfully sampling low temperature polar stratospheric clouds in regions bounded by Norway, Greenland, and the North Pole. These high, cold clouds are instrumental in the complex process of stratospheric ozone destruction.

Media are invited February 17, 6 a.m. PST, to Ames Cafeteria, Bldg. 235, Galileo Room, to view NASA televised coverage of a Washington D. C. press conference.

Dr. Robert Watson, Program Manager at NASA Headquarters, and Dr. Adrian Tuck of NOAA's Aeronomy Laboratory will make summary statements. The information will be simultaneously released in London, England and Oslo, Norway.

Background information, still photos and videotape will be available at the 9 a.m. press conference at Ames Research Center. The NASA Headquarters and Ames press conferences will be transmitted via Satcom F-2R, transponder 13, C-band, 72 degrees W. longitude, 3960.0 MHz, audio 6.8 MHz.

Ames Research Center provided aircraft operations and management, science project management, and made substantial scientific contributions to the interagency effort which included National Oceanic and Atmospheric Administration, the National Science Foundation's National Center for Atmospheric Research, the Chemical Manufacturer's Association, and a host of universities and NASA centers.

The research is conducted by the Earth System Science Division and the Science and Applications Aircraft Division at Ames Research Center in Mountain View, Calif.

February 13, 1989

NASA News

National Aeronautics and
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Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

C. J. Fenrick 415/694-5091

For Release:

Embargoed until 10:00 a.m.
February 16, 1989

Release No. 89-21

FACT SHEET

NASA AND THE U.S.S.R. IN THE COSMOS BIOSATELLITE PROGRAM

NASA has a long history of cooperation with the Soviets in space biology and medicine, dating from the 1971 U.S.-U.S.S.R. Space agreement. Under this agreement, a joint working group on space biology and medicine was established between the U.S.S.R. Academy of Sciences and NASA.

At the fifth Joint Working Group meeting on November 4, 1974, held in Tashkent, U.S.S.R., the Soviets invited the U.S. to perform joint experiments on a U.S.S.R. biosatellite. Subsequently, under this first working agreement, the U.S. participated in five Cosmos biosatellite missions on Cosmos 782, 936, 1129, 1514, and 1667, during the period 1975-1985. The twelfth and last Joint Working Group met September 1980 in Washington, D.C.

Under the 1971 agreement, NASA's Ames Research Center, Mountain View, Calif., has had lead responsibility for implementing U.S. participation in Soviet Cosmos missions. Five previous missions (Cosmos 782, 936, 1129, 1514, and 1667) have been launched over a ten year period from 1975 to 1985.

A new Agreement concerning the Cooperation in the Exploration and Use of Outer Space for Peaceful Purposes was signed in April 1987 by U.S. Secretary of State George Shultz and Soviet Foreign Minister Eduard Shevardnadze. The first meeting of the U.S./U.S.S.R. Joint Working Group on Space Biology and Medicine under this agreement was held in Moscow and Nal'chik, U.S.S.R. in August 1987. The second working group meeting was held in Washington D.C., in September 1988.

The U.S. again participated with Soviets in the most recent Cosmos biosatellite mission which was launched in September, 1987. In this mission, known as Cosmos 1887, U.S. participation included 26 major life sciences experiments, with a total of over 50 scientists from NASA's Ames Research Center and universities throughout the U.S.

In the recent collaborative Cosmos 1887 mission, a team of eight American scientists and engineers traveled to the U.S.S.R. in early October, 1987, for the return of the Cosmos spacecraft. The team was headed by James P. Connolly, Cosmos project manager, and Drs. Rodney Ballard and Richard Grindeland, project scientists at Ames Research Center. With respect to specific scientific results, the Cosmos 1887 experiments were conducted by more than 50 U.S. principal investigators and co-investigators both confirmed and expanded on the observations and findings of the U.S. Spacelab (SL-3) mission flown in 1985, and earlier U.S. and U.S.S.R. life sciences missions.

In addition to the biomedical experiments on Cosmos 1887, the U.S. placed eight radiation detector packages inside and outside the biosatellite spacecraft to measure radiation. These measurements determined the radiation dosages in space that could be harmful to astronauts in orbit.

The U.S.S.R. has invited the U.S. to participate in the next two Cosmos missions planned for early summer 1989 and 1991.

NASA News

National Aeronautics and
Space Administration
Ames Research Center
Dryden Flight Research Facility
P.O. Box 273
Edwards, California 93523
AC 805 258-8381

RELEASE NO. 89-23 October 20, 1989

Nancy Lovato
(805) 258-3449

NASA SCIENTIST WINS AWARD FOR FLIGHT TEST

Dr. Kenneth W. Iliff, Senior Staff Scientist at NASA's Ames-Dryden Flight Research Facility, has been honored with the 1989 Kelly Johnson Award from the Society of Flight Test Engineers for his significant contributions to flight test. The award was presented during the SFTE's annual meeting in Reno on September 21.

Iliff, 48, is well-known to the flight test community as a pioneer in the science and technology of aircraft parameter estimation -- how to formulate questions about airplane performance once the answers are known, or how to determine "why" when the "what happens" is known.

This award adds to many others Iliff has received during his 27-year career with NASA. "I am very pleased with this award, especially since it recognizes the importance of flight test. My work is very rewarding, but this is icing on the cake," Iliff commented.

He is currently associated with the Space Shuttle program, the experimental forward-swept-wing X-29, and the F/A-18 High Angle of Attack program, in addition to other research aircraft flown at Ames-Dryden.

Iliff's past awards have included NASA's highest scientific award and the American Institute of Aeronautics and Astronautics Dryden Lectureship. He is an elected Fellow of the AIAA, an honor given to notable contributors to aeronautics or astronautics. In addition, he was inducted into the National Hall of Fame for Persons with Disabilities in 1987 and was the NASA Outstanding Handicapped Federal Employee in 1973. He has authored about 80 technical papers.

He and his wife, Mary F. Shafer, are Lancaster residents. Ms. Shafer is an aerospace engineer with Ames-Dryden.

-NASA Ames-Dryden-

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Ames Research Center
Dryden Flight Research Facility
P.O. Box 273
Edwards, California 93523
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Release 89-24

October 25, 1989
(Simultaneously released
at Kennedy Space Center)

Lisa Fowler
Kennedy Space Center, Fla.
(Phone: 407/867-2468)

Nancy Lovato
Ames-Dryden Flight Research Facility, Edwards, Calif.
(Phone: 805/258-8381)

EDITORS NOTE: STS-33 NEWS MEDIA ACCREDITATION

NASA is accepting accreditation requests for news media to cover the Space Shuttle Discovery mission (STS-33), currently targeted for launch no earlier than November 19.

All news organizations wishing to send representatives to cover STS-33 must send a letter requesting accreditation for the mission. Previous requests for credentials do not apply to subsequent missions and new letters must be submitted.

Requests for credentials, launch through landing, should be submitted to:

NASA John F. Kennedy Space Center
PA-PIB/Accreditation
Kennedy Space Center, FL 32899

Please indicate the NASA location(s) from which you plan to cover the mission. Media planning to cover the landing only should submit their requests for accreditation to:

NASA Ames-Dryden Flight Research Facility
Attn: DXI/Public Affairs
P.O. Box 273
Edwards, CA 93523

-more-

Requests for accreditation must be made by a supervisory official other than the applicant on company letterhead, clearly indicating the assignment (reporter, photographer, technician, etc.) and social security number of each individual. Freelance writers and photographers must offer proof of assignment or evidence of past professional activity. The accreditation will be valid for all NASA news centers.

NASA ground rules for newspersons covering the mission are:

- o NASA can make no travel or housing arrangements.

- o Only working newspersons will be accredited at the news centers. Publishers and other news and advertising executives will not be accredited. These individuals should apply to NASA Public Services Division (LP), NASA Headquarters, Washington, D.C., 20546.

- o Friends, dependents or relatives not covering the mission will not be accommodated.

- o No one under 16 years of age will be allowed at the press site under any circumstances. Violation of this rule will result in cancellation of press site privileges for responsible parties.

- o Philatelic publications must meet the criteria for general publications or be national publications of recognized philatelic organizations. Representatives of catalogs, newsletters, local clubs or profit seeking projects will not be accredited. Conducting philatelic business, other than reporting, is not permitted.

- o College news media are limited to two accredited correspondents.

- o You must present your letter of acceptance and a photo identification to obtain a news media badge at the appropriate center.

- o Violations of the rules will result in loss of press badge and press site privileges.

-end-

NASA News

National Aeronautics and
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Ames Research Center
Dryden Flight Research Facility
P.O. Box 273
Edwards, California 93523
AC 805 258-8381

RELEASE NO. 89-25 November 8, 1989

Nancy Lovato
(805) 258-8381

VIEWING AREA NOT AVAILABLE FOR SHUTTLE LANDING

Space Shuttle Mission STS-33 is now scheduled for launch on November 20, 1989. Landing is planned for Edwards Air Force Base, California, however, since the flight is a classified Department of Defense mission no viewing site will be available.

Access to Edwards Air Force Base will be restricted to official business only during landing operations. There will be no guest access nor will usual NASA tours be held during that period.

The STS-33 landing time will not be announced until 24 hours prior to landing.

NASA officials expect the East Shore Viewing Site to be open for the following Space Shuttle mission, STS-32, now scheduled for an Edwards landing in December 1989.

-NASA Ames-Dryden-

NASA News
National Aeronautics and
Space Administration
Ames Research Center
Dryden Flight Research Facility
P.O. Box 273
Edwards, California 93523
AC 805 258-8381

RELEASE NO. 89-25 November 8, 1989

Nancy Lovato
(805) 258-8381

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-NASA Ames-Dryden-

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Space Administration

Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

For Release:

Diane F. Stanley 415/694-5091

Release No. 89-25 IMMEDIATE

NASA MALARIA FORECAST MODEL COMPLETES TEST PHASE
LIFE SCIENCE CHIEF ADDRESSES UNITED NATIONS

Researchers from Ames Research Center in Mountain View, CA, and the University of California, Davis, have successfully completed the first phase of a remote sensing malaria prediction model. NASA scientists plan to apply the Biospheric Monitoring and Disease Prediction project to other locations of potential malaria transmission.

Malaria is a critical global health problem, afflicting more than half the world's population. Approximately 2.9 billion people live in areas with active malaria transmission. World health authorities report over 100 million new cases and 1.5 million malaria deaths each year. Malaria is the leading cause of disability in tropical regions. The incidence is increasing.

The Biospheric Monitoring and Disease Prediction project (DI-MOD) has been successfully tested against field data from rice crops in California's Sacramento Valley. Project DI-MOD accurately described habitats producing dense anopheline mosquito populations two months before adult mosquitoes emerged. Anopheles freeborni mosquitoes are western carriers, or vectors, of the human malaria parasite. Although anopheline are found throughout California, malaria transmission is not prevalent.

The ability to predict time and location of anopheline mosquito populations will allow researchers to identify breeding

- more -

areas in other parts of the world and predict potential malaria transmission. Predicting environments yielding the greatest populations of mosquitoes two months prior to peak production is significant for implementing effective control measures. It allows the targeting of limited mosquito abatement procedures, which is much more efficient than "after the fact" on-foot sampling of traps and patient tracing methods now used.

Dr. Arnauld Nicogossian, Director, Life Science Division, NASA Headquarters, briefed the United Nation's Committee on the Peaceful Uses of Outer Space in late February on NASA's contribution to the fight against malaria.

The recently completed field tests in California's Sacramento Valley demonstrated that airborne and satellite remote sensing data can identify rice fields that will yield high percentages of anopheline mosquito populations. California produces up to 500,000 acres of irrigated rice annually, mostly concentrated in the Sacramento Valley. Irrigated rice is a primary breeding habitat for the Anopheles freeborni mosquito.

Researchers from UC Davis have long known that only a few rice fields produce high anopheline populations. To effectively control mosquitoes, high producing fields must be identified before crop and mosquito populations peak. Scientists monitored the rate of vegetation development using remote sensing data and correlated it with mosquito populations to predict locations of dense anopheline breeding two months prior to production, with greater than 83 percent accuracy.

The joint NASA Ames/UC Davis research team studied remotely sensed reflectance data in visible and near-infrared wavelengths that distinguish between surfaces covered with vegetation, and surfaces covered with water or soil. They observed that rice crops, while planted and peaking at the same time, emerged and developed at different rates.

Data were acquired from Ames ER-2 and C-130 aircraft, and Landsat and SPOT satellites to monitor the development of rice field vegetation in 104 commercial fields. Scientists noted that early development of crops correlated with high rates of mosquito production. Rice fields developing rapidly early in the growing season had higher anopheline populations than fields developing more slowly.

Of 104 fields studied, 16 rice fields accounted for 50 percent of the mosquito population; 36 fields accounted for 75 percent; and 52 fields accounted for 86 percent of total anopheline production. Researchers integrated ground and remote sensing data and used a statistical function to identify high and low mosquito producing fields. They were able to predict, with an accuracy of 83 percent, the 52 highest producing fields more than two months prior to peak anopheline mosquito production.

Project DI-MOD's Phase II was recently initiated in the coastal plain of Chiapas, Mexico. Scientists plan to develop a model of malaria transmission prediction by applying the Phase I monitoring techniques (of mosquito population dynamics) to a variety of habitats in Mexico.

Phase II is a five year collaboration involving NASA, the Uniformed Services University of the Health Sciences in Maryland, the Mexican government and its Center for Malaria Investigations. Malaria is a serious public health problem in Chiapas. In 1986, the Pan American Health Organization reported almost one million cases of malaria in the Americas, a 6 percent increase from 1985. Of 21 reporting Latin American countries, Mexico ranked second only to Brazil in total malaria cases.

Current research includes 1) describing mosquito breeding habitats from field, aircraft, and satellite data 2) field sampling of mosquito population dynamics 3) satellite monitoring of seasonal changes in surface water, and 4) building a geographic data base containing information on mosquito densities, human settlement, land use, and malaria incidence.

The data base will eventually be used to model the interaction of people, mosquitoes, and the malaria parasite required for disease transmission. When complete, NASA's model of vector (mosquito) borne disease prediction will integrate information on the disease cycle in the mosquito, the disease cycle in the human, the life cycle of the mosquito, the land use of people, and immigration patterns.

Future plans include modification of the technique for malaria plagued regions other than Mexico, transference of the technique directly to national and international users for integration into malaria control programs, and application of the technique to other vector-borne diseases such as schistosomiasis, trypanosomiasis, filariasis, and rift-valley fever.

The development of a model to successfully predict disease transmission depends on frequent satellite and airborne monitoring of environmental conditions that influence mosquito production - rainfall, standing water, agricultural land use, irrigation, drainage, temperature, soil, and topography. Recent advances in near-real-time data delivery and high spatial and spectral resolution data from satellites will support NASA's research in this public health concern.

NASA initiated Project DI-MOD in 1984, with assistance from Uniformed Services University of the Health Sciences, World Health Organization, Pan American Health Organization, University of California at Davis, University of Texas School of Public Health at Houston, and the Mexican Center for the Investigation of Malaria.

Ames Research Center and the University of California, Davis, began field work in 1985 in California's Sacramento valley. Ground testing in the Sacramento Valley began in 1987, with data analyses completed in 1988.

Biospheric Monitoring and Disease Prediction research is directed by the Ecosystem Science and Technology Branch at NASA Ames Research Center in Mountain View, Calif., and managed by the Life Science Division at NASA Headquarters, Washington, D. C.

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March 6, 1989

NASA Facts

National Aeronautics and
Space Administration
Ames Research Center
Dryden Flight Research Facility
P.O. Box 273
Edwards, California 93523
AC 805 258-8381

RELEASE NO. 89-26 Nov. 29, 1989

Nancy Lovato
(805) 258-3448

NASA HOSTS VIDEO CONFERENCE FOR TEACHERS

NASA's Ames-Dryden Flight Research Facility, Edwards, CA, will host a video conference about flight testing on Dec. 5 to aid teachers in presenting science and aerospace concepts in the classroom.

The conference begins at 11:30 a.m. PST and ends at 1:00 p.m. It is available on the WESTAR IV satellite, channel 19.

NASA's Educational Affairs Division sponsors a series of video conferences each school year on a variety of space and aeronautics activities. Following live presentations by experts in the particular subject, teachers are able to ask questions of the presenters by telephone toll-free.

The Dryden facility was chosen to host this segment because it is NASA's premier aircraft flight testing location and a leader in aeronautical research. The forward-swept-wing X-29 and an F/A-18 used for high angle of attack testing will be among the aircraft featured. Speakers will include some of the nation's leading test pilots.

Schools with a C-band satellite dish located within the continental United States can receive NASA educational teleconferences. To register for the conferences, educators should contact the NASA Aerospace Education Services Project, Videoconference Site Registration, 300 N. Cordell, Oklahoma State University, Stillwater, OK 74078-0422, or call 405/744-7015.

There is no charge for registration or participation in the video conference. Permission to videotape is granted to registered schools. Registration ensures that announcements, publications and other materials for teacher-participants are received by the school.

A fact sheet on these videoconferences is available locally from the NASA Ames-Dryden Public Affairs Office, (805) 258-3449.

-end-

NASA News

National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

Thomas P. Clausen 415/694-5544
Ames Research Center, Mountain View, Calif.

Peter W. Waller 415/694-5091
Ames Research Center, Mountain View, Calif.

Terri Sindelar 202/453-8400
NASA Headquarters, Washington, D.C.

For Release:
Immediate

Release No. 89-26

EDITORS NOTE: NASA TO CONDUCT TEACHER VIDEO CONFERENCE

On March 21, NASA's Educational Affairs Division, Office of External Relations, Washington, D.C., through Oklahoma State University, will conduct a teacher video-conference, via satellite, on NASA's current and future projects. This conference, "Technology for Your Classroom," will discuss NASA's Numerical Aerodynamic Simulation Facility (NAS) and Technology Uses For The Classroom.

The conference will originate from NASA's Ames Research Center, Mountain View, Calif. Dr. Kristin Hessenius, Ames assistant director of aeronautics, will present an overview of research using the NAS. Participating schools will receive the satellite transmissions from 11:30 to 12:30 p.m. PST.

The conference will be transmitted on Westar IV satellite, transponder 10D, channel 19. Media and organizations can access the satellite or view the event from NASA Headquarters, 400 Maryland Ave., S.W., Washington, D.C., room 6104.

- more -

This is the fourth and final teacher video conference of this school year. The 1988-89 school year conferences have featured speakers discussing NASA's aeronautics program, living in space and future exploration.

NASA's education satellite, video-conference series, now in its third year, are seen by more than 20,000 educators in 50 states. The live, 1-hour, interactive video-conferences are designed to update teachers on NASA programs and to demonstrate aerospace activities and materials available to classroom teachers.

NASA News

National Aeronautics and
Space Administration
Ames Research Center
Dryden Flight Research Facility
P.O. Box 273
Edwards, California 93523
AC 805 258-8381

RELEASE NO. 89-27 December 12, 1989

Nancy Lovato
(805) 258-8381

VIEWING AREA AVAILABLE FOR SHUTTLE LANDING

The East Shore Viewing Site at Edwards Air Force Base, Calif., will be available for viewers wishing to observe the landing of the Space Shuttle Columbia, mission STS-32, now scheduled for approximately 2:05 p.m. PST on Dec. 28, according to officials at NASA's Ames-Dryden Flight Research Facility at Edwards.

Vehicle passes are not required for the East Shore Site. The viewing site officially opens 24 hours prior to landing. Access to this site will be closed one hour prior to landing.

Normal access to Edwards Air Force Base will be restricted to official business only.

Viewers should follow news reports for any possible change in the landing date or location. Up-to-date landing information may be had by calling (805) 258-3520.

The East Shore Viewing Site offers an unobstructed view of the shuttle landing. Parking is on unprepared surfaces. Water and restrooms are available. Food and souvenir vendors are expected to be at the site.

-more-

Access to the viewing site is via secondary roads, and there may be congestion. There are two access routes to the East Shore Viewing Site.

Those traveling from the Los Angeles area should go north on the Antelope Valley Freeway (Highway 14), turn right (east) on the Avenue F off-ramp, then left (north) on Sierra Highway to Avenue E, right (east) on Avenue E to 140th Street, then left (north) on 140th to Avenue B, turn right (east) and Avenue B curves into Mercury Boulevard, which leads into the viewing area.

Those entering from Highway 58 should take the Rocket Site Road off-ramp to Mercury Boulevard, which leads into the viewing area.

-NASA Ames-Dryden-

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National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

For Release:

Immediate

Charles Redmond 202/453-1548
NASA Headquarters, Washington, D.C.

James Hartsfield 713/483-5111
Johnson Space Center, Houston

Peter W. Waller 415/694-5091
Ames Research Center, Mountain View, Calif.

Release No. 89-27

DISCOVERY'S RETURN-TO-FLIGHT PHOTOGRAPHS RECORD MANY FIRSTS

Earth observation photographs taken by Discovery's crew during America's return to piloted space flight in 1988 were among the clearest in more than 20 years, and they captured a variety of environmental conditions.

Included in the astronauts' photography from the September 1988 mission is a photograph showing at least a 1 million square-mile smoke cloud over South America's Amazon River basin and, in Africa, evidence of flooding in areas that have experienced a lengthy drought.

Due to an unexpected improvement in atmospheric clarity over the Northern Hemisphere, the Discovery crew could distinguish ground details about 700 miles away from their spacecraft, much farther than has been normal for Space Shuttle flights. Visibility STS-26 was the best since the 1960s Gemini Program flights.

- more -

In total, the crew took 1,505 photographs of Earth during the 4-day mission. Discovery was launched into an orbit that kept it above only the tropical and subtropical regions of parts of 122 nations and regions that hold about 75 percent of the world's population.

Photographs show a dense, white smoke cloud, the result of tropical forest, pasture and croplands being cleared and burned, completely obscuring the ground over much of South America's Amazon River basin. If placed over the United States, the same cloud would cover an area of the country more than three times the size of Texas.

It is the largest and thickest accumulation of smoke ever photographed by astronauts, much larger than the previous largest smoke cloud photographed by astronauts over the same region in 1984.

STS-26 also photographed smoke clouds over Sumatra and Borneo, Indonesia, Madagascar, eastern Africa, northern Australia and Bolivia. Some photographs show apparent irrigation features in the tropics -- in areas that normally receive 100 inches of annual rainfall.

In Africa, the "green line" of vegetation that generally marks the southern boundary of the Sahara Desert had moved the farthest north it has been in astronaut photography since 1965. Also, standing water was photographed in the Sahara.

For the first time in Shuttle history, Africa's Niger river was photographed in full flood and out of its banks. Photographs of the Blue and White Nile rivers also showed evidence of recent flooding.

Throughout eastern Africa, the landscape was tinted with green, a condition never before seen in this region during the Shuttle program. Still, Africa's Lake Chad and Lake Nasser, two lakes that have long been studied by space photography, were at the lowest levels ever photographed by astronauts. Since 1960, Lake Chad's surface area is estimated to have declined by more than 90 percent.

The extreme atmospheric clarity over the Northern Hemisphere during the mission was due, at least in part, to the absence of major global duststorms. Duststorms of million-square mile dimensions over northern Africa, even extending halfway across the Atlantic Ocean, were photographed during 1984 and 1985 Shuttle flights. But no such African duststorms were seen during STS-26, nor were major duststorms observed elsewhere.

A lack of recent major volcanic eruptions, which cause dust in the upper atmosphere, also may have contributed to the extreme clarity.

As a result, the STS-26 photographs captured details not usually seen in Shuttle photography: for the first time, an aircraft was photographed generating a contrail; individual buildings could be seen in the Canary Islands; a line of electrical transmission pylons was seen in southern Sudan; and oil platform flares were seen in the Gulf of Campeche. STS-26 also photographed the effects of Hurricane Gilbert on the Mexican Gulf Coast and five volcanos with signs of eruptive activity.

Earth photography from the Space Shuttle is managed by the Space Shuttle Earth Observations Office at the Johnson Space Center. The office trains Shuttle crews in Earth photography, selects targets for photography for each mission and analyzes the resulting photographs. In addition, research is conducted by specialists in environmental sciences, biology, climatology, geology and other fields using data obtained with Shuttle photography.

Photographs to illustrate this story can be obtained by calling 202/453-8372.

Color Photographs: 89-HC-138 thru 89-HC 150

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Peter W. Waller 415/694-5091

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FACT SHEET: ROLE OF AMES RESEARCH CENTER IN THE SPACE STATION

NASA's Ames Research Center is providing support and original research for many aspects of the U.S. Space Station program. The Center also will be a user of the Space Station, particularly in life sciences. It will develop payloads, support payload operations, and collect scientific data for investigators. It will support Space Station operations by working closely with the NASA centers that develop the hardware for the Station.

HUMAN FACTORS: Many studies at Ames Research Center investigate how control and maneuvering systems for the Space Station must operate and how the human crew can most effectively interface with these systems. These studies will continue through building of the Station and its subsequent evolution when more operational facilities are added later.

AUTONOMOUS SYSTEMS: Autonomous systems being developed at Ames Research Center are computer based "expert" systems which emulate some forms of human intelligence. These advanced systems will handle routine operations on the Space Station to free the crew to concentrate on the operations and research that benefit from human adaptability, intuition and creativity.

A systems autonomy demonstration project us underway at Ames Research Center to show how expert technology can be applied to operate the Space Stations' thermal control system.

- more -

SPACE ROBOTS: In addition, Ames Research Center is working on automated free-flying space robots with intelligence to perform routine extravehicular activities unattended in space. These could assemble elements of the Space Station, such as main booms or supporting structures for experiments. Future application of such intelligent robots could be to assemble part of a permanent base on the Moon or Mars before the landing of human crews.

TELESCIENCE: Researchers at Ames Research Center examine how the resources of the Space Station can be used productively with remote access from the ground; for example, for a scientist to control his experiments in the Space Station directly from his laboratory at a university.

MATERIALS MICROGRAVITY RESEARCH: How materials behave under conditions of microgravity is an important area of research essential to the building and operation of the Space Station. Ames Research Center scientists and technicians are making important contributions in this field; exploring how fires develop under conditions of microgravity where convection, which brings in oxygen to a fire, is inhibited, and researching how droplets form and the interactions between gas and fluids under conditions of microgravity. The unique computational fluid dynamics capabilities at Ames Research Center are being used to investigate and predict the behavior of materials in microgravity.

LIFE SCIENCES: How human beings might adapt to long terms of duty in space and subsequent return to Earth has been studied extensively at Ames Research Center for many years. These studies are continuing and are vitally important to the Space Station. Ames Research Center has a number of unique Life Sciences Research Facilities which directly support the Space Station program. Tests using a centrifuge are aimed at establishing what might be the minimum of simulated gravity required for human comfort during extended periods in space. Other studies are evaluating how simulated gravity, by rotation, might be used to advantage in space.

GRAVITATIONAL BIOLOGY: Ames Research Center has a major activity in gravitational biology which supports life science applications to the Space Station and the adaptability of living things to the environment within that station. Gravitational biology explores the fundamental aspects of how gravity affects living things at all levels from the single cell to the complete organism. The research has three broad aspects: the role of gravity in reproduction, development maturation, and evolution; gravity receptor mechanisms of living things, and the physiological effects of gravity.

CENTRIFUGE PROJECT. A 1.8 meter centrifuge provides the variable gravitational conditions for experiments to isolate the effects of spaceflight on test subjects such as biological cells, tissues, small plants, and small animals. This is being developed for use in the Space Station.

SPACESUIT: An advanced spacesuit, the AX-5 Hard Suit, intended for use on the Space Station, has been developed at Ames Research Center. It has passed one series of tests at NASA-Lyndon B.Johnson Space Center's water immersion test facility where microgravity conditions are simulated by flotation under water. The suit is made of aluminum and contains no fabric or soft parts that would be subjected to damage by atomic oxygen in the wake of spacecraft or by rocket propellants spilled into space. The suits gives high reliability, has low maintenance needs, and enhances mobility and comfort for its wearer. It shields the wearer against radiation and impact from small meteorites and space debris.

CELSS: Food, water, and a breathable atmosphere are three elements essential for human survival. NASA's project for a Controlled Ecological Life Support System (CELSS) is aimed at recycling of air, water, and waste products by biological systems. Food can be generated by such systems and plants naturally transpire to replenish the oxygen supply in space. Ames Research Center supports CELSS with basic research on environmental effects on plant biomass yield, time to harvest, and percentage of edible plant biomass produced. A plant growth chamber is a tool to examine the metabolism of growing plants, and to manipulate growth rates and oxygen production. Plants being studied include wheat, soybeans, lettuce, and potatoes.

POLAR ORBITING PLATFORM: Ames Research Center has investigated in depth the many facets of the Earth's ecosystem, correlating data from many instrument carried by high-flying aircraft and spacecraft. The information gathered by these remote sensing instruments have been correlated with ground-based observations and combined through sophisticated computations, image analysis and computer modeling. Studies are underway to apply the experience gained to remote sensing activities in the Space Station and its co-orbiting platforms.

GAS GRAIN FACILITY: A wide range of fundamental scientific problems involving interactions of small particles and clouds can be addressed by conducting microgravity experiments on the Space Station. A Gas Grain Simulation Facility (GGSF) will simulate and study fundamental chemical and physical processes and interactions among cloud crystals, dust grains, and other particles in the absence of near absence of gravity. The facility will investigate how particles are affected by magnetic, electric, and acoustical fields. Such research will help us to understand how gas and dust clouds in space evolve into stars, planets, and living things.

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Moffett Field, California 94035
AC 415 694-5091

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Diane Stanley 415/694-5091

News Release No. 89-42 IMMEDIATE

NASA TECHNOLOGY TESTED FOR COMMERCIAL FISHING APPLICATION

A NASA high altitude aircraft is flying an advanced airborne instrument over the Gulf of Mexico to aid in the development of a remote sensing system that will increase efficiency in the commercial fishing industry. The recently developed Airborne Ocean Color Imager (AOCI) was built under the Small Business Innovative Research Program in NASA's Office of Commercial Applications. After testing and refinement, the sensor will be marketed world-wide.

Ames Research Center's ER-2 aircraft is deployed to Johnson Space Center, Houston, Texas, May 9 - May 19, for three AOCI baseline flights over the productive fishing areas of the Gulf. The AOCI records water color in nine wavelengths and also water temperature. Correlations between water color, which reflects chlorophyll content, and fish concentration can provide fishing fleets with valuable information about fish location and reduce fuel and manpower expenses.

The Airborne Ocean Color Imager was originally developed as a simulator for a future satellite sensor. The commercial version of the instrument, when combined with near-real-time data processing and information delivery techniques, will increase the efficiency of fishing fleets and stimulate remote sensing enterprise.

The three year project's system development team includes Daedalus Enterprises, Inc., designer and manufacturer of the AOCI, NASA Ames development and testing of the AOCI, and NASA Stennis Space Center providing Learjet test capability and near-real-time data processing services during system development.

The user requirement team, providing surface truth during testing, includes NOAA's National Marine Fisheries Service, Zapata Haynie Corporation, and the Institute for Technology Development. The initial commercialization of the system will be carried out by Spectro Scan, Inc.

AOCI Project Manager is Mr. Robert Wrigley, of the Earth System Science Division at Ames Research Center in Mountain View, Calif. The ER-2 aircraft is managed by the Ames High Altitude Missions Branch, Science and Applications Aircraft Division. Stennis Space Center in Mississippi manages the transfer of NASA remote sensing technology into commercial demonstration projects.

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Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

Donald G. James 415/694-5091
Ames Research Center, Mountain View, Calif.

Mary Sandy 202/453-2754
Headquarters, Washington, D.C.

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NASA/DARPA LOW-COST PARALLEL-PROCESSING COMPUTER DEMONSTRATED

NASA's Ames Research Center, Mountain View, Calif., and the Defense Advanced Research Projects Agency (DARPA), Washington, D.C., announced today the successful demonstration of a low-cost parallel-processing computer with the potential of producing capabilities equivalent to today's most advanced supercomputers.

NASA Program Manager Betty Berkstresser said, "Today's demonstration of the power of parallel-processing computers, configured for specific applications, opens new horizons for the scientific and engineering community."

Col. L. "Doc" Dougherty, DARPA program manager, said, "This adds a low-cost, flexible, application-specific supercomputer to compete with more expensive general-purpose supercomputing machines in the world market. It is a good solution for engineering teams that need a dedicated computer for structures, aerodynamics or electromagnetic design."

General Microelectronics, Inc. (GMIC), San Diego, Calif., under a subcontract to Northrop Corp., Hawthorne, Calif., which provided a significant financial contribution, developed the system called Configurable Architecture Parallel Processing System (CAPPS). The CAPPS hardware measures just 18.3 cu. ft. The test

- more -

code used for the demonstration was FLO57, a standard 10,206 grid-point code used in computational fluid dynamics. On the CAPP's hardware, it has a sustained speed of 14 million floating-point operations per second.

By matching hardware and systems software using the systems approach, GMIC demonstrated the potential for supercomputing performance. This demonstration opens the possibility of vastly improving the cost effectiveness of computers applicable for a host of aerospace applications.

With this technology, engineers can have supercomputer power on easily-afforded computers. Simulation could be the immediate beneficiary of this advance in computer technology. Other disciplines with potential applications from this fallout of NASA/DARPA research include: simulation of multiple aircraft, flight control computers, computational fluid dynamics, structural analysis, computational electro-mechanics, artificial intelligence, data acquisition and process monitoring.

Computers normally execute "serially" -- marching through the code solving one line of a program at a time. Scientific programs modeling physical phenomena, e.g., simulations, have to calculate many simultaneous events sequentially. Parallel processing employs more than one processor. It is like having several mathematicians work a large problem instead of just one.

At stages in the problem, each processor will be waiting for answers from another, but interim solutions can be derived concurrently. With complex computer codes, the trick is to know which routines depend on each other to avoid data transfer delays and to efficiently use all processors.

Under the current DARPA-sponsored contract, Northrop will take immediate delivery of the eight-node CAPPS from its subcontractor GMIC and delivery of a 24-node system from GMIC within 60 days. A "node" refers to a processor or the equivalent of one computer.

The aerospace industry, NASA and the rest of the scientific community require solutions to problems so large and so computer-intensive as to be unaffordable using the largest supercomputers available today and those projected for the near future. Thus new directions need to be taken.

General Microelectronics recently formed Supercomputing Solutions, Inc., with Concurrent Computer Corp. to develop a complete product line of computational "engines" using parallel architecture supercomputer hardware and software for the solution of many scientific and engineering problems.

The research program was DARPA funded and Ames managed.

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A photograph to illustrate this release is available to media representatives by calling 202/453-8375 (Color: 89-HC-344, B/W: 89-H-324) or 415/694-5091.

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Peter W. Waller 415/694-5091
Diane F. Stanley

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AMES MARKS A HALF-CENTURY OF DRAMATIC
SPACE AND AERONAUTICS HISTORY

The year 1989 marks 50 years of major advances in U.S. space and aeronautics at NASA's Ames Research Center -- advances like solving the problem of atmosphere entry from space, exploring Jupiter, looking for life on Mars, designing airfield-to-orbit flight vehicles, and listening for messages from extraterrestrials.

Ground-breaking for Ames, the second-founded NASA center, took place on December 20, 1939.

With World War II looming, the country needed a second aeronautical research center. The site at Moffett Field, 45 miles south of San Francisco "with good flying weather all year," was selected.

A series of employee-oriented and public programs has been scheduled during 1989 to mark the Center's 50th anniversary year.

Some of the country's top scientists and engineers have made Ames' accomplishments. Among them are:

Finding, by the sometimes rambunctious theoretical aerodynamicist Harvey Allen in 1952, of how to return vehicles like the Apollo moon craft or ballistic missiles into the atmosphere from space -- at a time when no one knew how. Allen later became Ames' director.

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Discovery in 1958, by a group of Ames researchers including Dean Chapman, Clarence Syvertson, and Alfred Eggers, of how to use aerodynamic lift to fly craft, some of them known as lifting bodies, back into the atmosphere to a safe runway landing. This work led to the Space Shuttle.

In 1973, Ames' unmanned Pioneer spacecraft made the first trip to Jupiter -- first close-up pictures, and first measurements of the planet. In 1979, researchers repeated the feat at Saturn. A Pioneer orbiter and probes made the first comprehensive exploration of Venus, beginning in 1978. A Pioneer produced the first maps of Venus, and several thousand pictures of the cloud-shrouded planet. In 1983, Pioneer 10 made the first flight out of the solar system and is now 4.4 billion miles away, the most distant human object. Time for Pioneer's radio signal to reach us, traveling at the speed of light, is now an an incredible six hours.

The Pioneer project was managed by a hard-driving perfectionist, former wind tunnel engineer Charles Hall.

As almost the Center's first job, in 1941-1945, Ames' staff of young engineers made essential aerodynamic "fixes" in bombers and fighters, such as the P-51 Mustang, critically needed for the war effort in WW II.

By the 1980s, researchers were "flying" aircraft in the world's fastest supercomputers. They were obtaining research results directly -- by watching the "real" air flow, calculated at a billion computations per second, on television screens. Often these designs were for aerospace craft so radical they could not be tested in existing wind tunnels. At speeds higher than 13 times the speed of sound, this computational flight was the only kind of advance testing available. Pioneering for aerospace design by supercomputer was done by Ames' exceptionally young current director, William F. Ballhaus, Jr.

Supercomputer techniques will improve all aircraft design. But immediately and dramatically they are essential for the planned airfield-to-orbit-and-back National Aero-Space Plane, the "ultimate Space Shuttle."

By 1989, the Center had grown to around 5000 employees, with 944 acres at two locations, and facilities with a replacement value of $3 billion. In 1958, with passage of the Space Act, the National Advisory Committee for Aeronautics (NACA), Ames' parent agency, became NASA, and Ames a NASA center.

In 1981, Ames' engineers developed a brand new and unusual kind of airplane, the XV-15 tilt-rotor, which could take off or land vertically like a helicopter, but then fly horizontally for 500 miles at over 300 mph.

This craft has now evolved into the thousand-mile-range, military V-22 Osprey, which can carry 33 passengers. The Osprey and similar tilt-rotors have great promise for commercial transport situations involving very small areas for landing and takeoff.

The tilt-rotor, along with a range of powered-lift configurations, subsonic and supersonic, is representative of Ames' heavy involvement in vertical and short takeoff and landing craft research, which began in 1960.

Ames' life scientists made the first attempts to find life on Mars in 1976. Harold Klein, Ames' astute long-time director of life science, presided over development of the Viking life-detection experiment. Scientists operated it on the red planet aboard the Viking Lander spacecraft.

Ames' space medicine researchers have been seeking since the late '60s to determine whether man can tolerate the lengthy space flights required for the Space Station or for a two-year trip to Mars and return.

As part of the Center's planetary research, life scientists have sought to trace the assembly of chemical building blocks of life on the primitive Earth. Typical of a long series of origin-of-life experiments was the finding in 1970 of the nine "life" amino acids in the Murchison meteorite, believed to have come from the Asteroid Belt. Another was the finding of some of the earliest life forms in 3.2 billion-year-old South African shales.

Ames was given responsibility for NASA's basic research in life sciences in 1961.

Since then, in 1966-1969, Ames' Biosatellites flew eggs, plants, and insects to Earth orbit and return, finding a range of weightlessness effects on living systems.

Center life sciences and human factors work has grown into the biology laboratories (Spacelabs) which have flown or are scheduled aboard the Space Shuttle. Similar labs are planned for Space Station Freedom.

Ames' Space Station work also now includes a variety of automated "smart" systems with artificial intelligence, expert systems, and free-flying robot applications. Other Station developments are a durable space suit, the AX-5 "hard-suit" design, a concept begun in 1965. Researchers also are working on closed life support systems and long-term habitability problems for Space Station Freedom.

Since arrival of its first platform aircraft in 1965, the "Galileo," a Convair 990, Ames' airborne science has made a number of discoveries. In March 1977, scientists using the 36-inch infrared telescope aboard the Kuiper airborne observatory discovered Uranus' rings. Earlier they discovered that the prime ingredient in Venus' brilliant clouds was sulfuric acid. In the early '70s, an Ames U-2 made one of the first measurements of "big bang" radiation left over from formation of the universe. Scientists aboard the Kuiper have measured: a possible black hole in the galactic center, star formation, and the recent historic supernova data, as a blue giant star comes apart, step-by-step.

In the last two winters, Ames' scientists and high-altitude aircraft have made the first measurements of ozone destruction in both of the polar regions and identified the critical mechanisms in thinning of the Earth's protective ozone layer.

A major part of Ames history, comments Director Ballhaus, has been its development of unique facilities. In 1944, under the fabled Smith J. (Smitty) De France, Ames' first director and always a "big tunnel man," engineers completed the world's largest 40- by 80-foot wind tunnel. De France, a man of great breadth and directness, gave the Center much of its character and diversity. The "40 by 80" was big enough to test a fighter aircraft with engines running. In 1987, the tunnel, still world's largest, was doubled in size with addition of a second 80 by 120-foot test section (big enough for a medium transport, Boeing 737). Tunnel power was increased almost four times to 135,000 horsepower.

Beginning in the 1960s, Ames also developed the fastest flight tunnels. Some of these were counter-flow devices; one reached 34,000 mph, 9000 mph faster than Earth escape speed. Models of Mercury, Gemini, and Apollo and recently, the Galileo Probe -- slated to make the solar system's most difficult atmosphere entry at Jupiter -- flew in these tunnels.

These hypervelocity tunnels are accompanied by some 30 other Ames wind tunnels built over the years. They cover all speed ranges from low-speed to transonic, to hypersonic speeds.

Ames' unique flight simulators employ multi-story motion-generating machines, which move three-man cabs about as though they were in real flight.

The unique NAS supercomputer system is the world's most advanced with plans for speed of its central processor to reach a trillion (one thousand billion) computations per second by the turn of the century.

Perhaps most important of the Center's unique facilities is 65-square-mile Rogers Dry Lakebed in the Mojave Desert, largest airfield in the world with close to 365 days of clear flying weather. This is the site of the Ames-Dryden Flight Research Facility. There NASA's Space Shuttle can make its safest landings on seven-mile-long runways, and a variety of radical craft from lifting bodies to rocket planes, to the spectacular, forward-swept-wing X-29 have been, or currently are being, tested. In 1981, the Dryden facility, until then an independent NASA center, was merged with Ames.

As early as 1951, always modest Robert T. Jones, who had previously done the mathematics for developing the swept-back wings found on most of today's aircraft, did the calculations which resulted in the "supersonic area rule." This allowed minimum drag for subsequent supersonic aircraft.

In 1976, Jones devised the astonishing oblique wing. Here an entire rigid, straight wing rotates horizontally around its center to provide wing-sweep relative to the fuselage -- with one wingtip swept forward, the other trailing back.

A flying wing version of this unlikely unsymmetrical flight system may produce a supersonic transport efficient enough to span the Pacific at Mach 1.7, twice the speed of current jet transports.

In 1974, Ames began work on the thermal protection system for the Space Shuttle, an outgrowth of its work on heat shield design for intense heating during entry from space. This project produced the tiles and other materials which protect the Space Shuttle from atmosphere entry heating.

In 1977, as part of its tradition of work in airborne infrared astronomy, Ames built the IRAS telescope. IRAS made the first whole-sky survey in infrared light (good for seeing "cool" objects like planets, asteroids, brown-dwarf stars, and interstellar gas clouds).

In 1984, NASA headquarters and Ames selected investigators, and a science team for the infrared SIRTF, one of NASA's major telescope series. SIRTF, scheduled to fly in 1998, will be a thousand times more sensitive than IRAS.

In space sciences, Ames is an international leader. Researchers have made a range of major findings about formation and characteristics of stars and planets. Ames' scientists have done computer modeling of galaxy dynamics and collisions. Planetologist Ray Reynolds, whose interests cover all of the planets, predicted volcanos on Jupiter's orange moon, Io, well before arrival of the Voyager spacecraft to photograph these incredible mountains. Scientists, like non-stop producer of scientific papers James Pollack, explained Venus' greenhouse effect and proposed early oceans on Earth's twin planet. They provided scenarios for formation of all the terrestrial and gas giant planets of the solar system. They did a comprehensive Mars circulation model, and models for all the planets with atmospheres.

In 1981, construction began on the Galileo Probe spacecraft, scheduled to make the first entry into the atmosphere of an outer planet (Jupiter). Entry speed will be 115,000 mph, with forces of 350 G's, and the Probe will then fly 500 miles deep into giant Jupiter's atmosphere. Galileo is to be launched in October 1989.

Finally, in 1983, led by Barney Oliver, who has pushed the project for 30 years, SETI (Search for Extraterrestrial Intelligence) began at Ames. This program uses existing telescopes to listen for radio signals from other intelligent species in our galaxy. So far, no word from out there.

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National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

Peter W. Waller 415/694-5091
Ames Research Center, Mountain View, Calif.

Mike Goodkind 415/725-5376
Stanford University Medical Center, Stanford, Calif.

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AMES PROGRAM STUDIES STANFORD HELICOPTER PILOTS

If Stanford University Hospital Life Flight helicopter chief pilot Steve Greene says NASA is watching his every move, he isn't paranoid; he's a participant in an experiment.

For about five weeks until mid-June, Greene or one of his three pilot colleagues will take an instant before they lift off the hospital's roof on a mission to hook up a cardiac monitor. Meanwhile, a NASA researcher will connect two videotape monitors.

After every flight, each rise or fall of the pilots' heart rates will be compared with tapes of their hands and feet at work, the view from the cockpit, and other factors, such as weather and air traffic. NASA scientists will analyze the data to compare the pilots' stress levels with what they've been doing at work.

Robert J. Shively, one of the National Aeronautics and Space Administration research psychologists leading the project, said he's hopeful the data from the project will help both the space program and the nation's emergency helicopter programs.

The Stanford Life Flight program was selected as the test site because of its proximity to NASA-Ames but, more importantly, "because of its excellent safety record and shift (safe crew scheduling) policies. It can thus provide baseline data for

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further studies of the industry," said Sandra G. Hart, Chief of the Rotorcraft Human Factors Branch at NASA-Ames, which is conducting the project.

Not unlike the space program, emergency helicopter flying is complex.

"In most types of aviation, you know exactly where you are going. With EMS (emergency helicopter) you don't have that luxury," Greene explained in an interview. "Much of the time you're heading to an imprecisely described location that isn't marked or set up for a landing. There is a lot more night flying than the average helicopter pilot is involved with. And there is a patient out there who's depending on you to complete your mission."

The scientists, with the cooperation of the Life Flight pilots, are looking at such questions as whether a computer program can be devised to help pilots decide whether it's safe to fly. Along the way, the team will be proving such specific questions as which way to turn a map so a pilot can read it in flight most easily or, for that matter, what information should be on the map to help the busy pilot know his or her location without sifting through a clutter of irrelevant information.

"Pilots are faced with countless decisions about whether to accept a mission," Shively explained. "They must factor in their own fatigue, weather, landing conditions, air traffic, and then decide whether it's safe or not to go." The researchers are trying to find out how these variables work together so that a computer program can help assess the risk of a particular mission before the flight begins.

The pilot's heart rate is one measure of stress and safety. If there are consistent times of high stress as measured on the heart monitor, this would be useful in measuring risk, notes Shively.

Every 10 minutes the Life Flight pilots record a brief statement about what they're doing, and then give a subjective evaluation of their stress level based on a point system that starts with 100 (totally relaxed) but has no maximum.

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The heart rate monitors, Vitalog PM8s, are compact and don't restrict the user's motion, Greene said. They are monitors used by NASA in previous applications. The videotaping monitors are miniaturized units developed by the space program. To save space in a crowded helicopter, only one tape is used for both cameras. The two sets of images appear on alternate frames and are decoded later.

Every time a Life Flight pilot returns, one of the NASA researchers asks the pilot what visual cues he used on the ground to reach the destination. The pilots make hand drawn maps to show what geographical features or visual features were important to them.

"These are things I really haven't ever stopped to think about in 23 years of flying," said Greene, who added that the project is encouraging him to approach the tasks of his job analytically.

For pilot Everett Croes III, the most common cues are the hills surrounding Stanford, the coast and, at night, city lights.

"Wherever in the world you fly," said Croes, who has flown over Nigerian mangrove swamps, Vietnam rice paddies and Indonesian oil rigs, "there are features you need to look for. In an uninhabited mangrove swamp, for example, sometimes the only clue available is subtle changes in the color of the plant life which might signal an approaching coastline."

Vernol Battiste, another NASA research psychologist who formerly worked as an air traffic controller, believes that maps can be improved by offering realistic visual symbols so that busy pilots can orient themselves quickly without having to stop to convert triangles into towers, circles into oil tanks, or one of the myriad other symbols used on many maps.

Even better, map information may soon be transferred into computer data which can appear on a screen in front of the pilot. The image would change as the helicopter moved, and the scale could be changed, for example, as needed.

"The pilots have maps on their laps, on the seats, literally all over the cockpit. It would be extremely convenient to put that on a monitor," Battiste said.

"But before someone can do that, we need to know what information the pilot needs to know. Obviously we can't assume that the pilot in his three dimensional world is going to need the same information as a motorist, or a geologist looking for likely oil-rich rock formations," Battiste explained. "This study will collect some of the data needed."

Battiste said computer map makers must determine whether pilots like to see their maps with north at the top, or with the direction they're flying at the top. Preliminary studies indicate that pilots are about evenly divided on this question, "so whoever designs it will probably have to build in a choice."

Earlier NASA helicopter workload studies have involved the California Highway Patrol, the military, and private rotorcraft operators. The differences and similarities will be compared and contrasted to see if a universal database can be developed for all helicopter operations.

"This study is potentially useful for Life Flight, since everything we can learn about aircraft safety is of benefit to our program and the entire aeronautical industry," said Sue Lockman, program manager of Life Flight. "We're proud we were selected as the first EMS program to participate with NASA."

The researchers include Shively, Battiste, Susanne Delzell, research psychologist at San Jose State University; Torgny R. Nilsson, research assistant at NASA; and Lockman. Pilots, in addition to Greene and Croes, are Bob Penix and Ken Rose.

The Life Flight program has flown nearly 2,500 missions since it was inaugurated in May 1984. The aircraft, currently a twin-engine BK 117, is equipped comparably to a hospital intensive care unit, and each patient mission is staffed by at least one specially trained flight nurse and a physician.

Many flights involve contact with the patient at the site of the accident or injury, followed by transport to an appropriate hospital. Other missions involve transport of patients from a

- more -

small community hospital to a larger specialized center, such as Stanford.

Photographs of operation with pilots and experimenters are available from Mike Goodkind, Stanford University Medical Center, 415/725-5376.

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Ames Research Center
Moffett Field. California 94035
AC 415 694-5091

C. J. Fenrick 415/694-5091
Ames Research Center, Mountain View, Calif.

Mary Sandy 202/453-2754
Headquarters, Washington, D.C.

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NASA SELECTS BENDIX FOR COMPUTER CONTRACT NEGOTIATION

NASA's Ames Research Center, Mountain View, Calif., has selected Bendix Field Engineering Corp., Columbia, Md., for final negotiations leading to award of a contract for information and communications support services.

The proposed 5-year contract will be a cost-plus-award-fee type with an estimated value of $32.7 million for the basic 2-year period, a 1-year priced-option period and a final 2-year priced option period.

The contractor will provide personnel, material, equipment and other resources necessary to perform the operation, maintenance, test, repair and modification of the existing voice telephone system, message center, teleconferencing system, radio equipment, cable plant, audio/video system, data communications system, network control system and personal computer support. These services will be used to support numerous programs and projects at NASA's Ames Research Center.

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Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

C. J. Fenrick 415/694-5091
Ames Research Center, Mountain View, Calif.

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Mary Sandy 202/453-2754
Headquarters, Washington, D.C.

Release No. 89-51

NASA SELECTS COMPUTER FIRMS FOR CONTRACT NEGOTIATIONS

NASA's Ames Research Center, Mountain View, Calif., has selected four companies for contract negotiations for the acquisition of general purpose, interactive computer systems.

The companies selected are Convex Computer Corp., San Jose, Calif.; Digital Equipment Corp., Landover, Md.; Silicon Graphics, Inc., Mountain View; and Sun Microsystems Federal, Inc., Mountain View.

This acquisition will initiate new firm-fixed-priced requirements-type contracts for work to be performed at Ames Research Center. At least four contracts will be awarded. The period of performance will consist of a 3-year base period with two 2-year priced options. The estimated total cost of the multiple awards over the 7-year period will be $97 million.

The general purpose interactive computers being acquired include single- and multi-user systems. The companies selected will provide the necessary hardware, software, maintenance, support and training to fulfill researcher requirements.

- # # # -

6/13/89

NASA News

National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

Peter W. Waller 415/694-5091
Ames Research Center, Mountain View, Calif.

For Release:
Immediate

Mary Sandy 202/453-2754
Headquarters, Washington, D.C.

Release No. 89-54

BALLHAUS TO RESIGN AS DIRECTOR OF NASA'S AMES RESEARCH CENTER

Dr. William F. Ballhaus, Jr. has resigned as Director of NASA's Ames Research Center effective July 15.

Ballhaus served as Director of the Center from January 1984 through January 1988, and from February 1989 until the present. As Director he was responsible for all research and development programs and the overall management of the Ames Research Center at Moffett Field, Calif., and the Ames-Dryden Flight Research Facility at Edwards Air Force Base, Calif. Ames and Ames-Dryden, which have more than 5,000 employees, conduct research and development programs in the fields of aeronautics, life science, space science, space technology, and flight research.

Ballhaus also served as Acting Associate Administrator for the Office of Aeronautics and Space Technology at NASA Headquarters, Washington, D.C., from February 1988 through March 1989. In this temporary position, he was responsible for direction of NASA's aeronautics and space technology programs, as well as for the institutional management of NASA's Ames, Langley and Lewis Research Centers.

- more -

Citing inadequate compensation for senior federal executives and vague new post-government employment regulations as factors in his decision, Ballhaus expressed regret at leaving federal service. "It has been a privilege to have worked for NASA for the last 18 years. I will miss the Agency and the many outstanding people with whom I have shared so many wonderful experiences," he said. "It is a terrific organization and will be an exciting place to be under Dick Truly's leadership. However, my family situation is such that public service in the current environment is no longer a viable option for me."

Ballhaus began his NASA career in 1971 at NASA-Ames in the Computational Fluid Dynamics Branch. In 1979, he became Chief of the Applied Computational Aerodynamics Branch. He served as Director of Astronautics for the Center from 1980 through 1984.

Throughout his career, Ballhaus has received many distinguished awards. Among them are: the Presidential Rank of Distinguished Executive, the Presidential Rank of Meritorious Executive, the Senior Executive Association's Distinguished Executive Service Award, and the American Institute of Aeronautics and Astronautics' (AIAA) Lawrence Sperry Award for his pioneering work in numerical methods and computer codes for predicting transonic flow fields about aerodynamic configurations.

Ballhaus recently completed a one-year term as President of the AIAA. He is a Fellow of the AIAA and of the Royal Aeronautical Society and has been elected to the National Academy of Engineering and the International Academy of Astronautics. He serves on advisory boards for a number of academic and research institutions.

An honors graduate of the University of California at Berkeley, Ballhaus received his B.S. in mechanical engineering in 1967, M.S. in mechanical engineering in 1968, and Ph.D. in engineering in 1971. He served in the U.S. Army Reserve from 1968 to 1976, achieving the rank of Captain.

A Los Angeles native, Ballhaus is married to the former Jane Kerber. They have four children.

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National Aeronautics and
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Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

For Release:

C.J. Fenrick 415/694-5091

Immediate

Release No. 89-56

HARDING NAMED CHIEF, PUBLIC

INFORMATION OFFICE AT AMES

Wendell "Del" Harding, Jr. has been named chief, Public Information Office at NASA's Ames Research Center, Mountain View, Calif. Harding is transferring to Ames from the U.S. Department of the Interior Bureau of Land Management (BLM), Billings, Mont., where he was chief of Public Affairs staff. He directed and coordinated the BLM's public affairs and public involvement program in 16 field offices in three states.

In his new post, he is responsible for NASA public information for Ames and the 11 western states, and public affairs support for shuttle missions.

Harding received his Bachelor's degree in journalism from the University of Nebraska and has received numerous writing and publication awards and honors. He was born in 1932 in Lincoln, Neb. He and his wife, Shirley, will reside in Sunnyvale, Calif. They have two daughters and two granddaughters.

7/13/89

NASA News

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Ames Research Center
Moffett Field. California 94035
AC 415 694-5091

Diane Stanley 415/694-5091

For Release:
Immediate

Release No. 89-62

AMES RESEARCH CENTER RECEIVES DESIGN AWARD

NASA Ames Research Center has received the 1989 Human Environment Award presented by the American Society of Interior Design (ASID). Ames was honored by the ASID for its habitability research supporting human productivity and well-being in the isolated and confined environment of the international Space Station Freedom.

Dr. Yvonne Clearwater, the Habitability Research and Development Program leader, accepted the citation on behalf of Ames and the Habitability Research Team on July 22 at the ASID Award Ceremony in Oakland. The research team was comprised of more than 40 researchers from NASA, academia and industry.

The award is among the most prestigious awards presented annually by the ASID. The ASID is the largest organization of professional interior designers in the world. Ames' contributions to advancing knowledge of the built environment were cited for improving the quality of interior design and increasing the protection, assistance and awareness of the consumer.

Ames' Space Habitability Research and Development Program began in 1984 with the primary goal of maximizing the perceived quality of life, or habitability, in advanced spacecraft and space facilities where crewmembers' productivity and psychological health are challenged by the rigorous environmental and social conditions of long-term space missions.

The habitability team's innovative design research program has produced guidelines for functional interior design in the small group ecology of space habitats, an economical computer model

- more -

for pre-mission analyses of Space Station Freedom's operational environments and an award winning microgravity body restraint system.

Spatial disorientation in near weightlessness impacts astronauts' physical and psychological health. Habitability research has documented the successful use of color brightness as a body orienting cue in microgravity. Because humans have adapted to Earth's environment of a lighter sky perceived as "up" or headward, a ceiling with at least two percent lighter surface will provide spatial cueing for the body and reduce disorientation.

Another Ames habitability study documented stress reduction and enhanced morale using photographic materials in place of windows. Occupants performing demanding tasks in confined technical settings benefit by "looking outside," even if the "view" is a picture. The apparent depth of field in a landscape painting or photograph is a critical factor in creating a calming effect on viewers. Extensions of this study are underway with scientists and support personnel confined during the Antarctic winter and pre-surgical patients in a large hospital setting.

Antarctic research stations serve as the closest analog to surface operations phases of planetary exploration. Antarctic winter-over crews and astronauts on advanced space exploration missions experience high levels of risk and non-rescuability; physical confinement in small habitable volumes; social isolation; physical, emotional and material deprivation; and alteration of circadian rhythms due to unfamiliar daylighting cues. Additional Ames research involves investigations in underwater habitats in the U.S. Virgin Islands.

Ames' habitability research represents NASA's commitment to ensuring the survival, safety, and well-being of the most vital component of advanced space missions: human beings. "We consider it our responsibility to not only promote the productivity of people housed in space, but to assure that once there, they will thrive, not merely survive. It is tremendously exciting to realize that by defining and meeting human needs in space environments, we're helping to create more supportive places for living and working on Earth," said Clearwater.

This research is being conducted in the Crew Research and Space Human Factors Branch, Aerospace Human Factors Research Division at Ames Research Center in Mountain View, Calif.

7/26/89

NASA News

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Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

C.J. Fenrick 415 694-5091
408 738-3098

For Release:

Sept. 14, 1989

MOUNTAIN VIEW, Calif. -- An aerospace engineer at NASA's Ames Research Center will be honored Sept. 28 for inventing a deicing system for aircraft and ships.

Leonard A. Haslim, program manager in the civil technology office, will receive a Research & Development (R&D) 100 Award at a ceremony in Chicago. Sponsor of the award is Research & Development magazine, a division of Reed publishing, Des Plaines, Ill. In the competitive selection process, over 1000 inventions were submitted but only 100 were chosen.

R&D magazine has sponsored award programs for 27 years. More than 500 companies and government research laboratories, domestic and foreign, submitted over 1,200 inventions for consideration. Haslim and 100 other inventors will have their inventions exhibited for one month at the Research and Development 100 Show in Chicago, until Oct. 29.

- more -

Aircraft icing is very dangerous and common occurrence for planes and helicopters. According to National Transportation Safety Board statistics, ice caused 344 aircraft mishaps between 1977 and 1987, including 124 fatal accidents in which 443 people died.

Haslim's invention is the most effective and least power consumptive deicing/anti-icing system on the market today.

The system operates like two plastic coated magnets that push away from each other when they receive an electrical charge. Using a larger version of a power supply typically used to operate a camera photo flash, the system's stored electrical energy produces a mechanical pulse that can reduce ice that has grown from frost to one-inch thick ice into powder.

Haslim's invention, the Electro-Expulsive Separation System (EEDS), is lightweight and fits easily onto almost any part of an aircraft or nautical vessel that accumulates unwanted ice. It is thin enough (1/50 inch) not to impede air flow.

The EEDS will enhance aircraft safety and operational capability, since many planes and helicopters cannot safely fly in severe icing conditions. The EEDS will also be used on naval and commercial ships which run the risk of capsizing from heavy ice loads. Other applications include bridge surfaces, communication towers and power lines.

Haslim served as a jet fighter pilot for the Navy during the Korean War, where he cultivated a keen interest in aviation safety. He has contributed to many important fields since earning several advanced degrees. For example, he has invented a light

- more -

weight non-flammable cushioning for aircraft seat to reduce the potential hazard of toxic smoke. He also invented a compact helicopter rescue boom, which could enhance the rescue of swimmers, climbers and fire victims in high-rise buildings. The government and an aircraft corporation have joined to develop this idea. Haslim was named the 1988 NASA Inventor of the Year for his invention of the EEDS.

NOTE TO EDITORS AND NEWS DIRECTORS: Haslim will demonstrate his invention Thursday, Sept. 21, at NASA's Ames Research Center, Moffett Field, Calif., from 10:00 to 11:00 a.m.

Media representatives can attend this event by contacting the Public Information Office at 415 694-5091 by Sept. 20 and indicating who will attend.

NASA News

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Space Administration

Ames Research Center
Moffett Field. California 94035
AC 415 694-5091

Peter W. Waller 415/694-5091, 415/493-9406

Diane Stanley 415/694-5091, 415/326-0774

For Release:

Sept. 20, 1989

NOTE TO EDITORS AND NEWS DIRECTORS: A pre-launch news conference on the Jupiter mission of the Galileo Probe Spacecraft will be held at NASA's Ames Research Center at 10 a.m., Thursday, Sept. 28.

The Galileo Probe will be launched by the Space Shuttle Atlantis no earlier than Oct. 12. It will be carried to Jupiter aboard the Galileo Orbiter. It will make history's first entry into the atmosphere of an outer planet in 1995.

Galileo Probe is a Bay Area project, with Probe spacecraft and management and science-return located at Ames. Project officials and scientists will outline the Probe mission spacecraft status and expected science results.

The Probe will fly down 400 miles into Jupiter's atmosphere. It will make the first direct atmosphere measurements, look for lightning, dense water clouds, and clues to Jupiter's hurricane winds. It will tell us much more about the outer gas-giant planets, origin of the solar system -- and, from the hydrogen/helium ratio, origin of the universe.

- more -

With the hardest entry in the solar system, the Probe flies in at 115 mph, with forces of 350 g, and temperatures of 28,000 degrees Fahrenheit.

The Probe Project is managed by NASA-Ames. The Probe was built by Hughes Aircraft, El Segundo, Calif. The overall Galileo Mission is managed by NASA's Jet Propulsion Laboratory, Pasadena, Calif.

News reporters planning to attend should come to the Ames Pass and ID Office and will be directed from there. Print and still photo material will be available and, for TV, two clips with new mission animation and other scenes. News organizations can downlink the briefing from NASA Select television: Satcom F2R, transponder 13, 72 degrees West longitude.

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NASA News

National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

C. J. Fenrick
Ames Research Center, Mountain View, Calif.
(Phone: 415/694-5091)

For Release:

October 23, 1989

Mary Sandy
Headquarters, Washington, D.C.
(Phone: 202/453-2754)

NASA's Ames Research Center, Mountain View, Calif., has selected Boeing Aerospace Operations, Inc., Cocoa Beach, Fla., for final negotiations leading to award of a 5-year contract valued at approximately $43 million including all options.

Boeing will provide support services at Mountain View and Ames-Dryden Flight Research Facility, Edwards, Calif., in the following areas: reliability and quality assurance, system safety engineering, test engineering, configuration management, and institutional safety, health and environmental services.

It is anticipated that the final negotiations will lead to a cost-plus-award-fee contract and be completed in 30 days.

89-79

NASA News

National Aeronautics and
Space Administration

Ames Research Center
Moffett Field. California 94035
AC 415 965-5091

Contact: Peter W. Waller 415/694-5091 (office)
415/493-9406 (home)

For Release:
Oct. 27, 1989

MOUNTAIN VIEW, Calif. -- Instruments on the Galileo probe are performing as programmed, NASA reported Friday. The probe is on board the Galileo orbiter spacecraft which was launched from the space shuttle Atlantis Oct. 18.

The spacecraft is now two million miles from Earth on its way to Jupiter. In July 1995, the probe will detach from the spacecraft and will make history's first entry into the atmosphere of an outer planet.

"We feel some relief," said Benny Chin, probe project manager at NASA's Ames Research Center, following analysis of the first probe instrument tests since launch. "All seven probe instruments operated normally." The probe had been dormant since launch until controllers completed Friday's status check.

- MORE -

The instruments were turned off following the test and will not be checked again until November 1990.

When launched into Jupiter's atmosphere, the probe will make the first direct measurements of the giant planet's winds, radiation belts, lightning flashes, brilliant cloud layers and atmosphere. The data will be sent back to Earth via a special relay radio on board the Galileo spacecraft, which will orbit Jupiter 120,000 miles above Jupiter as the probe descends.

The tests of the probe instruments were conducted by NASA-Ames managers at NASA's Jet Propulsion Laboratory. JPL manages the overall Galileo mission, and Ames manages the probe project.

During its 2.5-billion-mile, six-year trip to Jupiter, the spacecraft -- considered the most sophisticated ever launched -- will swing by Venus once and Earth twice, gaining speed each time. After the second Earth bypass in December 1992, Galileo will be traveling 87,200 miles an hour, heading for Jupiter.

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NASA News

National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

Contact: Del Harding 415/694-5091 (office)
408/244-2680 (home)
Mary Sandy 202/453-2754 (office)

For Release:
Dec. 11, 1989

WASHINGTON, D.C. -- NASA Administrator Richard H. Truly today named Dr. Dale L. Compton as director of NASA's Ames Research Center, Moffett Field, Calif. Compton's appointment becomes effective on Dec. 20, the 50th anniversary of the center's groundbreaking.

Compton, who succeeds Dr. William F. Ballhaus Jr., has been acting director since Ballhaus' resignation on July 15.

Compton, 54, previously served as acting center director from February 1988 to January 1989. He served as deputy director of Ames with line management responsibility for the center's facilities, personnel and programs from 1985 to 1988 and from January through July 15, 1989.

- more -

As director, Compton will be responsible for all research and development programs and the overall management of the Ames Research Center at Moffett Field and the Ames-Dryden Flight Research Facility at Edwards Air Force Base, Calif. Ames-Moffett and Ames-Dryden, which have more than 5,000 employees, conduct research and development programs in the fields of aeronautics, life science, space science, space technology and flight research.

Compton's professional career has been spent with NASA-Ames, where he served as a research scientist for 15 years and published over 25 papers on aerodynamic and aerothermodynamic subjects. He also has held the following positions at Ames: deputy director of astronautics, chief of the space science division, manager of the infrared astronomical satellite (IRAS) telescope project office, and director of engineering and computer systems.

Compton was educated at Stanford University where he received a B.S. degree in 1957, an M.S. in 1958 and a doctorate in aeronautical engineering in 1969. He was a Sloan Fellow at the Massachusetts Institute of Technology from 1974 to 1975 and attended the Harvard Advanced Management Program in 1986. He has received the NASA Outstanding Leadership Medal and is a Fellow of the American Institute of Aeronautics and Astronautics. In September, Compton was awarded the rank of "distinguished executive" by President Bush for his leadership and professional achievement.

Compton and his wife, Marilyn, have two children. They reside in Cupertino, Calif.

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89-88

NASA News

National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, California 94035
AC 415 694-5091

Contact: Peter W. Waller 415/694-5091 (office)
415/493-9406 (home)

For Release:
Dec. 27, 1989

PIONEER DATA PROVIDE

NEW CELESTIAL CONSTANTS

MOUNTAIN VIEW, Calif. -- Using extensive light measurements made by the Pioneer 10 and 11 spacecraft, a NASA scientist has produced "celestial constants" that will be highly useful to astronomers and physicists. The new constants are the first "pure" measurements of the various kinds of background light in our solar system, galaxy and universe.

Work conducted by Dr. Gary Toller of Goddard Space Flight Center, Greenbelt, Md., and General Sciences Corp., Laurel, Md., indicates that background light from beyond the solar system is made up of: around 82 percent light from faint stars, 17 percent galactic light diffused by dust, and less than 0.6 percent light from beyond the galaxy.

- more -

Toller has used his light data as another way to calculate total amounts of visible matter in the universe. These calculations confirm other estimates that 90 percent of matter in the universe is "missing" or unseen dark matter.

Since much of our knowledge of the universe comes from visible light, the data will provide a benchmark in many fields of astronomy and physics. The Pioneer 10 and 11 photo-polarimeter measurements have provided the first observations of incoming light without interference of solar system light. The Pioneers are managed by NASA's Ames Research Center, Mountain View, Calif.

The new work, combined with other measurements, also provides a clue to chemical composition of solar, galactic and cosmic dust. It gives an accurate measure of the Sun's position above the plane of the galaxy (about 12 parsecs). It describes how cosmic dust scatters light. For the entire celestial sphere, 60 percent of light is scattered by dust, not absorbed -- predominantly in the same direction it was traveling.

Toller and others used a variety of observations from Earth for the analyses combining data on the quantities of stars and types of stars with computer models of light scattering in the galaxy, amounts of dust and gas and size of particles. Then he compared these models to measurements made by the Pioneers as the two spacecraft moved out of the solar system.

The new data will help investigators study diffuse celestial light sources such as zodiacal light, which reaches Earth after being reflected by nearby dust. For an astronomer on Earth,

- more -

looking in a random direction in space, 40 percent of incoming light is zodiacal light.

Once the Pioneers were beyond 300 million miles, the zodiacal light diminished to a negligible level, and scientists were able to make the first pure measurements of background light from beyond the solar system in the mid-1970s. Since that time, over the long flight paths of the Pioneers, it has been possible to make very exact measurements of this "outside" light.

Background light from beyond the solar system breaks down into integrated starlight from stars too faint to be seen by the eye, diffused galactic light reflected by dust particles in the galaxy and light coming from outside the galaxy.

Toller reported his work at the international conference on galactic and extragalactic background radiation in Germany earlier this year.

Toller is continuing to refine and apply the data. Dr. Jerry Weinberg of the Institute for Space Science and Technology, Gainesville, Fla., and Dr. Ana Nash, U.S. Naval Research Laboratory, Washington, D.C., also have worked on the analysis.

Both Pioneers 10 and 11 are still returning data. Pioneer 10 has left the solar system and is 4.4 billion miles from the Sun. Pioneer 11 has almost reached the orbit of Neptune. Both spacecraft were built by TRW Inc., Redondo Beach, Calif.

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NASA News

National Aeronautics and
Space Administration

Washington, D.C. 20546
AC 202-453-8400

Mary Sandy
Headquarters, Washington, D.C.
(Phone: 202/453-2754)

Del Harding
Ames Research Center, Mountain View, Calif.
(Phone: 415/694-5091)

For Release:
December 11, 1989
1 p.m. EST

RELEASE: 89-182

COMPTON NAMED AMES RESEARCH CENTER DIRECTOR

NASA Administrator Richard H. Truly today named Dale L. Compton as Director of the NASA Ames Research Center, Moffett Field, Calif. Compton's appointment becomes effective on December 20, the 50th anniversary of the center's groundbreaking.

Compton, who succeeds Dr. William F. Ballhaus, has been Acting Director since Ballhaus' resignation on July 15.

Compton previously served as Acting Director for the Center from February 1988 to January 1989. He served as Deputy Director of Ames with line management responsibility for the center's facilities, personnel and programs from 1985 to 1988 and from January through July 15, 1989.

As Director, Compton will be responsible for all research and development programs and the overall management of the Ames Research Center at Moffett Field and the Ames-Dryden Flight Research Facility at Edwards Air Force Base, Calif. Ames-Moffett and Ames-Dryden, which have more than 5,000 employees, conduct research and development programs in the fields of aeronautics, life science, space science, space technology and flight research.

Compton's professional career has been spent with NASA Ames where he served as a research scientist for 15 years and published over 25 papers on aerodynamic and aerothermodynamic subjects. He also has served as Deputy Director, Astronautics; Chief, Space Science Division; Manager, IRAS Telescope Project office; and Director, Engineering and Computer Systems at the Center.

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Compton was educated at Stanford University where he received a B.S. degree in 1957, an M.S. in 1958 and a Ph.D. in aeronautical engineering in 1969. He was a Sloan Fellow at the Massachusetts Institute of Technology from 1974 to 1975 and attended the Harvard Advanced Management Program in 1986. He has received the NASA Outstanding Leadership Medal and is a Fellow of the American Institute of Aeronautics and Astronautics.

Compton and his wife, Marilyn, have two children. They reside in Cupertino, Calif.

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NASA News

National Aeronautics and Space Administration
Ames Research Center
Moffett Field, California 94035-1000

Contact: Peter W. Waller 415/694-5091
415/493-9406
Christine Miller 408/429-8951

Jan. 5, 1990

MOUNTAIN VIEW, Calif. -- An Ames Research Center scientist, Alvin Seiff, has been selected to receive the American Institute of Aeronautics and Astronautics (AIAA) Von Karman Lectureship Award in Astronautics. The lectureship is one of the AIAA's top awards.

Past recipients include two NASA Center directors, heads of several major aerospace companies and other industry notables. Seiff is the first recipient from Ames.

The lectureship honors Seiff for "early leadership in basic hypersonic research. . .the concept of planetary probes and for application of this research to the atmospheres of Mars, Venus and Jupiter on the Viking, Pioneer-Venus and Galileo Missions." Seiff will receive the award and present the lecture at the AIAA 28th Aerospace Science Meeting in Reno, Nev., January 9-10. He will repeat the lecture before sections of the AIAA in various parts of the country.

- more -

The lecture covers the 25-year history of planetary atmosphere probe studies of Mars (Viking) and Venus (Pioneer), plus plans for Jupiter (Galileo).

Seiff is currently senior research scientist and principal investigator for the Galileo probe atmosphere structure experiment, a key part of the Galileo mission to Jupiter. Galileo was launched in October 1989. He also is working with a group ofAmes space scientists to design an atmosphere structure experiment for Titan, largest moon of Saturn.

Seiff's career began as a researcher on the Manhattan Project, and teacher of physics at the University of Tennessee. He joined NASA's predecessor agency, the National Advisory Committee on Aeronautics in 1948. In 1950, he was appointed chief of the Ames Supersonic Free Flight Wind Tunnel Branch, which made studies of hypersonic flight at velocities up to escape speed. Named in 1963 to head Ames Vehicle Environment Division, he directed basic research on hypersonic flow, planetary entry physics, materials in space and structural dynamics.

He was heavily involved in solving problems of hypervelocity reentry vehicles. In 1959, he led an effort at Ames to explore the problems of manned flight to the moon, before the Mercury and Apollo missions. Since 1962, Seiff has concentrated on NASA's atmospheric probes to Mars, Venus and Jupiter.

In 1970, a group under Seiff's leadership demonstrated the techniques later used to measure the atmospheres of Mars and Venus with a probe vehicle in the Earth's atmosphere. In 1979 Seiff was selected to be principal investigator of the Galileo Probe atmosphere structure experiment, after earlier atmosphere measurements at Mars and Venus with the Viking landers and Pioneer-Venus probes. Seiff has published more than 80 scientific papers and has received numerous awards and honors.

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NASA News

National Aeronautics and Space Administration
Ames Research Center
Moffett Field, California 94035-1000

Contact: Jane Hutchison 415/694-5091 (office)
Del Harding 415/694-5091 (office)
408/244-2680 (home)

Jan. 10, 1990

MOUNTAIN VIEW, Calif. -- You say your brain feels just a little fuzzy early in the morning, and you can't seem to get moving without a jump-start of caffeine?

It may be that your fuzzy brain and a fuzzy pink fungus have more in common than you think. Scientists working with NASA's Ames Research Center hope to determine whether the internal biological clocks of living organisms are affected by the weightlessness of space. These are the same clocks which make some of us wake at sunrise and cause others to sack out until noon.

In an experiment flying on board the space shuttle Columbia, which was launched this week, physiologists are studying the growth rates and patterns of the fungus Neurospora crassa to determine whether these internal clocks, which are common to nearly all plants and animals, function normally in the absence of

- more -

all known geophysical and environmental time cues. A previous flight experiment in 1983 showed that these rhythms can persist in the microgravity of space, although disruptions of growth rates and rhythmic quality were noted.

In humans, behavioral and physiological rhythms such as metabolism, glandular secretions and sleep rhythms follow approximate 24-hour cycles, corresponding to the Earth's 24-hour rotation around the sun. Neurospora also displays rhythmic growth patterns approximately every 22 hours when grown under certain light and temperature conditions. These bodily cycles are known as circadian rhythms.

One in a series of circadian rhythm experiments to fly in microgravity, the current experiment is designed to focus on an external clock-setting mechanism, the lack of gravity, in the Neurospora mold. Ground-based studies have shown that Neurospora is sensitive to changes in the magnitude and direction of a gravitational force.

"Neurospora is an ideal candidate for our study because it is a simple organism whose biological rhythms and responses to light and temperature are very similar to those of higher plants and animals," said principal investigator Dr. James Ferraro, assistant professor in the Southern Illinois University School of Medicine, Carbondale, Ill.

The most sensitive tests of circadian rhythms must be conducted in space, free of possible time cues from the Earth. Randy Berthold, secondary payloads project manager for Ames' Space Life Sciences Payloads Office, notes that "Because the shuttle orbits the Earth every 90 minutes and crew members don't follow standard sleep-work patterns, normal 24-hour time cues are greatly diminished, if not eliminated."

Prior to launch, experimental cultures were grown by inoculating one end of a long, sterile cylindrical tube with Neurospora. Each tube contains agar, a gelatinous substance made from seaweed that provides nutrients for the growing mold. Cultures were grown in constant bright light for two days. The tubes then were divided into three groups: 25 clear, 15 wrapped in red paper, and 10 maintained in total darkness. Each group was placed in a light-proof foam-lined flight package containing an ambient temperature recorder prior to loading into the shuttle's mid-deck.

On the first day of flight, the 25 clear tubes were removed, exposed to light, the growth of the fungus marked, and gas samples taken from three of the tubes. Gas sampling can be used to determine whether the gaseous environment in the tube has a significantly higher concentration of carbon dioxide at the growth front. Neurospora is sensitive to abnormally high carbon dioxide concentrations.

The 15 tubes wrapped in red filter paper undergo the same procedures. The other tubes will remain in total darkness for the duration of the flight. At the end of the 10-day flight, Ferraro will remove the temperature recorder, perform a preliminary analysis of the tubes and prepare them for final analysis at Southern Illinois University.

- more -

By providing the laboratory in which to study these biological rhythms, the NASA hopes to determine whether they arise internally or are responses to external, perhaps as yet unknown, cues. "The more we understand the source of these biological rhythms, the more we can ultimately improve the performance of astronauts in space, as well as the everyday activities of people on Earth," Ferraro said.

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NASA News

National Aeronautics and Space Administration

Ames Research Center
Moffett Field, California 94035-1000

Contact: Del Harding (415) 604-9000 (office)
(408) 244-2680 (home)

Jan. 11, 1990

MOUNTAIN VIEW, Calif. -- Telephone numbers at NASA's Ames Research Center will change on Jan. 15.

The current 694 exchange will be replaced at Ames by a 604 exchange. For example, the center's switchboard telephone number is (415) 694-5000; the new number will be (415) 604-5000.

All Ames numbers will be affected. The change is being made to increase Ames' phone system capacity.

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Note to Editors and News Directors: The new phone number for the Ames Public Information Office (responsible for handling news media inquiries) will be (415) 604-9000.

90-03

NASA News

National Aeronautics and Space Administration

Ames Research Center
Moffett Field, California 94035-1000

Donald G. James 415/604-3935
415/462-8778 (home)
C. J. Fenrick 415/604-3937

January 29, 1990

MOUNTAIN VIEW, Calif. -- Two NASA's Ames Research Center employees have received a major NASA award for developing a way to reduce aircraft fuel and operating costs.

Dr. Heinz Erzberger and Homer Q. Lee developed a system for computing the most fuel-efficient flight path. The system computes optimum climb, cruise and descent trajectories, on a typical airline flight. "This saves approximately $200 million in fuel cost per year," says Erzberger. It has been incorporated into computer software programs used on Boeing 767/757 and McDonnell Douglas MD-80 aircraft as well as on other commercial and military aircraft.

C. Thomas Snyder, Ames' aerospace systems director, said their innovation "represents a major contribution to both civil and military aviation. It has strongly influenced the design of modern flight management systems."

The NASA "Space Act" award given the two men consists of certificates and $15,000, which the two men will share. Erzberger is assistant chief of Ames' aircraft guidance and navigation branch. Lee is an aerospace engineer in the same branch, which is part of Ames' flight systems and simulation research division.

# # #

NASA News

National Aeronautics and Space Administration

Ames Research Center
Moffett Field, California 94035-1000

Contact: Peter W. Waller 415/604-3938 (office)
415/493-9406 (home)

Feb. 23, 1990

MOUNTAIN VIEW, Calif. -- On Feb. 23, Pioneer 11 will cross the orbit of Neptune and become the fourth spacecraft to leave the solar system, providing a coda to humanity's first major planetary explorations. Pioneer 11 will join Pioneer 10 and Voyagers 1 and 2 in searching for the heliopause, the point at which the sun's electromagnetic influence gives way to the galaxy's.

As it crosses Neptune's orbit, Pioneer 11 will be 2.8 billion miles from the Earth. Neptune's orbit currently marks one measure of the expanse of the solar system because for the next 12 years Pluto's eccentric orbit carries it inside Neptune's path. (Some scientists refer to the heliopause as the edge of the solar system. By that definition, all four spacecraft are still within the solar system.)

- more -

Launched in 1973, Pioneer 11 provided scientists with their closest view of Jupiter, passing within 26,600 miles of the cloud tops in December 1974. The close approach and the spacecraft's speed of 107,373 mph, by far the fastest speed ever reached by a man-made object, hurled it 1.5 billion miles across the solar system toward Saturn.

Before reaching Saturn in 1979, Pioneer 11 reached an inclination of 17 degrees above the solar equatorial plane, high enough to illuminate the true character of the sun's magnetic field. Now 780 million miles above the ecliptic (the plane in which most of the planets orbit the sun), the spacecraft recently showed that many of the "solar cosmic rays" in the heliosphere originate outside the sun's atmosphere in the interstellar gas, the space between the stars.

Pioneer 11 flew within 13,000 miles of Saturn and took the first close-up pictures of the planet. Instruments located two previously undiscovered small moons and an additional ring; charted Saturn's magnetosphere and magnetic field; and found its planet-size moon, Titan, to be too cold for life.

Pioneer 11, which will traverse interstellar space in the same direction as the sun moves, continues to return good data. But in three years operating the radio transmitter and scientific instruments simultaneously will be difficult, says NASA project manager Richard Fimmel. Technical adjustments may extend the craft's life through 1995. Pioneer 10, with a stronger power supply, may return data through the year 2000, which would extend its original 30-month design life to 28 years.

- more -

In June 1983, Pioneer 10 made history by becoming the first human artifact to leave the solar system, travelling in the direction opposite Pioneer 11's path. On Feb. 23, Pioneer 10 will be 4.5 billion miles from Earth. Returning data over a one-way light time of 6 hours, 36 minutes, Pioneer 10 continues to search for the heliopause, for very long-wavelength gravity waves that would further our understanding of Einstein's theory of relativity, and for evidence of a 10th planet.

The Pioneers are managed by the Ames Research Center, Mountain View, Calif., for NASA's Office of Space Science and Applications. The spacecraft were built by TRW Space & Technology Group in Redondo Beach, Calif.

# # #

NASA News

National Aeronautics and Space Administration

Ames Research Center
Moffett Field, California 94035-1000

Contact: Del Harding (415) 604-9000 (office)
(408) 244-2680 (home)

March 2, 1990

LOS ANGELES -- A conference to provide educators information about the giant space telescope NASA will place in orbit in April will be held in Los Angeles.

Dates for the conference depend on whether the space shuttle Discovery is launched as scheduled April 12. If it is, the conference will be held April 16-17 at the California Museum of Science and Industry in Los Angeles, and then move to NASA's Ames-Dryden Flight Research Facility at Edwards Air Force Base for the landing of Discovery.

NASA's Hubble Space Telescope is scheduled to be placed in orbit the day Discovery is launched.

The conference, designed for college, secondary and elementary school teachers and administrators, will include briefings by Hubble project scientists and engineers. It will provide information on the design, science objectives, instrumentation and overall mission.

- more -

NASA Ames Research Center, the California Association for Aerospace Education, the Jet Propulsion Laboratory and the museum are co-sponsors. Registration information is available by contacting Thomas B. Clausen, Educational Programs Officer, NASA Ames Research Center, Mail Stop TO-25, Moffett Field, Calif. 94035-1000. His phone number is (415) 604-5544.

The 43-foot, 25,000-pound telescope will provide astronomers with a view of planets, stars and other objects from above the Earth's obscuring atmosphere. It will allow astronomers to detect light sources 25 times fainter than with ground-based observatories. During the next 15 years, the data obtained may help answer questions about how stars and galaxies form and evolve, the size of the universe and what other planets in our solar system are like.

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NASA News

National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, California 94035-1000

Contact: Del Harding (415) 604-9000 (office)

(408) 244-2680 (home)

Mary Sandy (202) 453-2754

March 6, 1990

MOUNTAIN VIEW, Calif. -- Victor L. Peterson was named today as deputy director of NASA's Ames Research Center by Dr. Dale L. Compton, center director.

Peterson, 55, has served as Ames' director of aerophysics since 1984. He served as the center's acting deputy director in 1988 and 1989.

Peterson has held various positions at Ames, including research scientist, chief of the aerodynamics branch and chief of the thermo and gas dynamics division. He was one of the originators of the NASA initiative to develop the Numerical Aerodynamic Simulation System, the leading computational resource for the nation's aerospace program.

Peterson joined Ames in 1956 after receiving a bachelor's degree in aeronautical engineering from Oregon State University. He also holds a master's degree in aeronautics and astronautics sciences from Stanford University and a master's degree in management from the Massachusetts Institute of Technology, where he was an Alfred P. Sloan Fellow.

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Peterson has served on many national boards and committees, including a National Science Foundation committee chartered to assist with the creation of national supercomputer centers at several universities. He has written about 50 technical papers and reports in the fields of fluid and flight mechanics and on the use of supercomputers in science and engineering. He was awarded the NASA Outstanding Leadership Medal in 1984 and was elected a Fellow of the American Institute of Aeronautics and Astronautics in 1986.

A native of Saskatoon, Saskatchewan, Canada, Peterson and his wife, Jacqueline Dianne, reside in Los Altos, Calif. They have three children.

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NASA News

National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, California 94035-1000

Contact: Del Harding (415) 604-9000 (office)
(408) 244-2680 (home)

March 28, 1990

MOUNTAIN VIEW, Calif. -- NASA's Ames Research Center has received the world's first Cray Y-MP 8128 supercomputer.

It has the largest main memory of any Cray Y-MP supercomputer built to date and represents a major upgrade in computing capability at Ames. It is being installed at the Numerical Aerodynamic Simulation (NAS) facility at Ames. The NAS facility is a national computer laboratory which provides hardware and software support for computational fluid dynamics and other large-scale computational disciplines.

The facility is used primarily for the flight simulation of aircraft and aerospace vehicles by government, industry and university researchers throughout the nation.

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The Cray Y-MP 8128 has 128 million words of mainframe central memory. In addition, the system has 256 million words of high performance secondary memory through its solid state storage device memory. It uses the Cray Research operating system UNICOS, based on AT&T's UNIX System V, and a suite of compilers, utilities and other software tools.

The Cray Y-MP 8128 system replaces the Cray Y-MP 832 supercomputer installed at Ames in 1988. It has four times as much memory as the older machine. The Cray Y-MP has performed at sustained speeds of more than one billion calculations per second.

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NASA News

National Aeronautics and Space Administration
Ames Research Center
Moffett Field, California 94035-1000

Contact: Diane F. Stanley 415/604-9000 (office)
Brian Dunbar 202/453-1547 (office)
Del Harding 415/604-9000 (office)
408/244-2680 (home)

May 10, 1990

MOUNTAIN VIEW, Calif. -- Cattle pastures that were once Brazilian tropical forests may be contributing to the buildup of greenhouse gases in the atmosphere, NASA scientists report.

A team headed by Dr. Pamela Matson of Ames Research Center sampled nitrous oxide emissions in three ecosystems within Brazil's Amazon Basin: undisturbed rain forests, recently cleared and burned areas, and land converted to cattle pastures. The researchers found that nitrous oxide emissions from recently cleared areas were not significantly higher than those from undisturbed rain forest. However, annual emissions from pastures were three times as high as levels obtained from representative samples of tropical forest.

- more -

Nitrous oxide is a greenhouse gas, trapping heat close to the Earth's surface that would otherwise radiate into space. Various studies have shown nitrous oxide concentrations in the atmosphere are increasing by 0.2 to 0.3 percent each year, but investigators studying global climate have been unable to explain the increase.

"This is the first study showing the potential importance of tropical land use changes on greenhouse gases other than carbon dioxide," said Matson. "Given that tropical deforestation is occurring so rapidly, this effect could have global significance."

Recent estimates by the United Nations Food and Agriculture Organization and the U.S. National Academy of Science indicate approximately 15 to 20 million acres of tropical forests are cleared each year for pasture and agricultural use. Another 35 million acres of regrown forest are cleared annually for slash-and-burn agriculture and for other short-term uses.

Nitrous oxide is a byproduct of the alteration of nitrogen by microbes in the soil. When it reaches the upper atmosphere, nitrous oxide also contributes to the breakdown of the ozone layer.

The clearing of tropical forests illustrates the complexity of environmental interactions related to potential global climate change. In addition to potentially increasing greenhouse-gas emissions, the clearing of forests removes a vast carbon "sink" by destroying large numbers of plants that remove carbon dioxide from the atmosphere for photosynthesis. The burning of the trees after clearing directly releases vast quantities of carbon dioxide, another greenhouse gas, into the atmosphere. The net effect of

- more -

such clearing on atmospheric chemistry, however, has never been precisely quantified, and its exact effect on global climate remains a question.

The findings were reported by researchers from NASA's Ames Research Center, Moffett Field, Calif.; Brazil's Institute for Research in the Amazon; and Stanford University, Stanford, Calif. The report was based on data gathered in the Amazon Basin in 1987 and 1988. The study's research team included Dr. Gerald Livingston from Ames, Flavio and Regina Luizao of the Brazil Institute and Dr. Peter Vitousek of Stanford.

The study was supported by the Biospheric Research Program within NASA's Office of Space Science and Applications. The research was initiated in collaboration with the Amazon Boundary Layer Experiment, which was funded by NASA's Tropispheric Chemistry Program.

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NASA News

National Aeronautics and Space Administration

Ames Research Center
Moffett Field, California 94035-1000

Contact: George Meguiar 407/452-2121 (office)

Del Harding 415/604-9000 (office)
408/244-2680 (home)

May 25, 1990

MOUNTAIN VIEW, Calif. -- A toll-free telephone number for information about Space Shuttle missions is now available.

By calling 1-800-SHUTTLE, callers can hear a 45-second recorded message which includes an updated shuttle launch schedule. The service is sponsored by Spaceport USA, which operates tours and a visitor center at NASA's Kennedy Space Center in Florida.

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90-28

NASA News

National Aeronautics and Space Administration

Ames Research Center
Moffett Field, California 94035-1000

Contact: Jane Hutchison (415) 604-4968 (office)

Del Harding (415) 604-9000 (office)

(408) 244-2680 (home)

May 25, 1990

MOUNTAIN VIEW, Calif. -- How can astronauts grow their own food, live and work on the moon and safely explore the harsh environment of Mars?

Research into these and similar questions will be the prime focus of the newly created Advanced Life Support Division at NASA's Ames Research Center in Mountain View, Calif. William E. Berry, who heads the new organization, said the goal is to support President Bush's plan for a permanent lunar settlement and a manned mission to Mars.

Berry said the new division, which consolidates these research efforts at Ames under a single organization, will focus its efforts on developing new technologies that will allow humans to live and work productively in space for long periods of time.

- more -

As missions become longer and crews larger, storing or resupplying food, water, oxygen and other consumables becomes prohibitively expensive and difficult. The life support system necessary to meet crew members' daily needs without resupply consists of several elements: thermal control, air revitalization, and food, water and solid waste management. Berry's division has responsibility for developing several new life support technologies, including:

-- "Closed-loop" life-support systems, which use physical or chemical means to generate nutrients, gases and liquids from waste products. Ames is the lead center for development of physical-chemical systems, which use chemical processes to convert carbon dioxide, waste water and solid wastes to breathable air, potable water and food.

-- A "bioregenerative closed-loop" system, called CELSS (Controlled Ecological Life Support System), which uses plants to produce food and recycle water vapor, oxygen and carbon dioxide. Work at Ames emphasizes developing a crop growth research chamber and space flight investigations to study the performance of CELSS technology in space and to maximize the growth of edible plants under controlled conditions.

-- Creation of new space suits and portable life support systems. These technologies could be used in the exploration of Mars or the lunar surface. Included is the AX-5 space suit, an all-metal high-pressure suit which will for the first time allow astronauts to exit the shuttle or space station without first breathing pure oxygen for several hours. This "pre-breathe" phase is currently necessary to prevent the "bends," a life-threatening condition resulting from the formation of nitrogen bubbles in the blood stream.

Berry is conducting a nationwide search for scientists and engineers to join his research and development team. "We are looking for talented, creative people who want to help develop the space technology of the future," he said. "The unique human habitats we will build in space may provide us with technologies useful in solving some of the critical environmental issues which we face on Earth today."

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NASA News

National Aeronautics and Space Administration

Ames Research Center
Moffett Field, California 94035-1000

Contacts: Del Harding (415) 604-9000 (office)
(408) 244-2680 (home)
Jeffrey Carr (713) 483-5111
Mary Sandy (202) 453-2754

June 13, 1990

MOUNTAIN VIEW, Calif. -- Astronaut Steven A. Hawley has been named associate director (acting) of NASA's Ames Research Center in Mountain View, according to Dr. Dale L. Compton, center director.

"We are extremely pleased," Compton said, "to have someone with Dr. Hawley's administrative and scientific skills joining us at Ames." Hawley, 38, has served as deputy chief of the NASA Astronaut Office at Johnson Space Center in Houston since 1987. At Ames, he will be the third-ranking executive behind Compton and Victor L. Peterson, deputy center director. He will start work at Ames in late July.

Hawley has been an astronaut since 1978. He has flown on three space shuttle missions and has logged 412 hours in space. Hawley worked as a simulator pilot in the shuttle software laboratory and on astronaut support crews for shuttle missions STS-2, STS-3 and STS-4 before making his first space flight.

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He first flew as a mission specialist on the maiden voyage of Discovery, STS-41D, in August 1984. Discovery's crew deployed three communications satellites and activated the OAST-1 solar cell wing experiment. He made his second trip to orbit aboard Columbia on STS-61C in January 1986, during which Hawley participated in the deployment of the Satcom K-1 satellite and conducted experiments in astrophysics and materials processing.

During his most recent mission in April on Discovery he successfully delivered NASA's Hubble Space Telescope into orbit using the shuttle's robot arm.

Hawley's home town is Salina, Kan. He is an honors graduate of the University of Kansas and received his doctorate in astronomy and astrophysics from the University of California at Santa Cruz in 1977. He is a member of the American Astronomical Society, the Astronomical Society of the Pacific, Sigma Pi Sigma and Phi Beta Kappa. In 1988, he was awarded the NASA Exceptional Service Medal.

Hawley is married to the former Eileen M. Keegan of Redondo Beach, Calif. His parents, Dr. and Mrs. Bernard Hawley, live in Rancho Mirage, Calif.

- # # # -

NASA News

National Aeronautics and Space Administration

Ames Research Center
Moffett Field, California 94035-1000

Contact: Jane Hutchison (415) 604-4968 (office) June 14, 1990

Del Harding (415) 604-9000 (office)

(408) 244-2680 (home)

Paula Clegggett-Haleim (202) 453-1547 (office)

MOUNTAIN VIEW, Calif. -- The first working model of a "salad machine" that eventually will provide a variety of fresh vegetables for astronauts on long voyages is now growing its first crop at NASA's Ames Research Center.

Dr. Mark Kliss, project manager and principal investigator, said one of the first things astronauts and submariners ask for following days or weeks of eating freeze-dried or preserved foods is fresh produce. "Our goal is to produce a variety of fresh salad vegetables for consumption by the crews of Space Station Freedom and other long-duration missions," Kliss said.

The presence of plants and the ability to "cultivate" a garden also can improve the crew members' morale by providing something for them to nurture and by offering a creative outlet during their free time, much like tending a garden on Earth, he said.

- more -

Garden-variety plants such as leaf lettuce, carrots, radishes, onions, sprouts, tomatoes, peppers and cucumbers are being considered for inclusion in the salad machine. Most candidate vegetables have very similar temperature, humidity, lighting and nutrient requirements, simplifying the environmental control system necessary. Because of limited space, some plants will be smaller than the varieties commonly found on Earth.

Tomato plants, for example, will be less than 12 inches high. And because there is no gravity, some of the vegetables will grow "upside down" or "sideways," although in the weightlessness of space there is no true "up" or "down."

Kliss' goal is for the salad machine to produce three salads per person per week for a crew of four. It also will recycle the water transpired by plants back into the nutrient delivery system. Kliss hopes the salad machine eventually can use recycled water to grow plants and produce potable water for crew consumption.

It will also furnish oxygen-enriched air to the cabin environment after particulates and excess water vapor are removed. Food production, carbon dioxide scrubbing, oxygen generation and water purification are key functions of the "bioregenerative" life support systems being developed by the Advanced Life Support Division at Ames.

Project engineers also face formidable engineering constraints. The amount of space available is limited to a single standard space station rack of 36 inches by 41.5 inches by 80 inches, or about 28.2 cubic feet of growing volume. The machine

- more-

must operate on less than a kilowatt of power, produce a minimal amount of waste heat and provide light for the plants.

A nutrient delivery system must be designed which can provide water and necessary nutrients to the growing plants while keeping fluids in place in the microgravity of space. Kliss said that proper humidity will be maintained by recycling condensed water vapor, which also will decrease the amount of resupply water needed.

The process of growing plants in the salad machine should be relatively simple. Seeds, contained in cassettes for ease of handling in microgravity, will be germinated for a few days. Once the seeds sprout, they will be placed in the plant growth chamber containing the nutrient delivery system. Kliss expects the activity of "planting" seed cassettes and harvesting mature plants to require 15-20 minutes of an astronaut's time every few days. By applying commercial hydroponic (soil-less) growing techniques, plant growth time from seed to harvest is much quicker than for field-grown counterparts.

Kliss hopes to have the salad machine fully operational by Space Station Freedom's scheduled completion later this decade.

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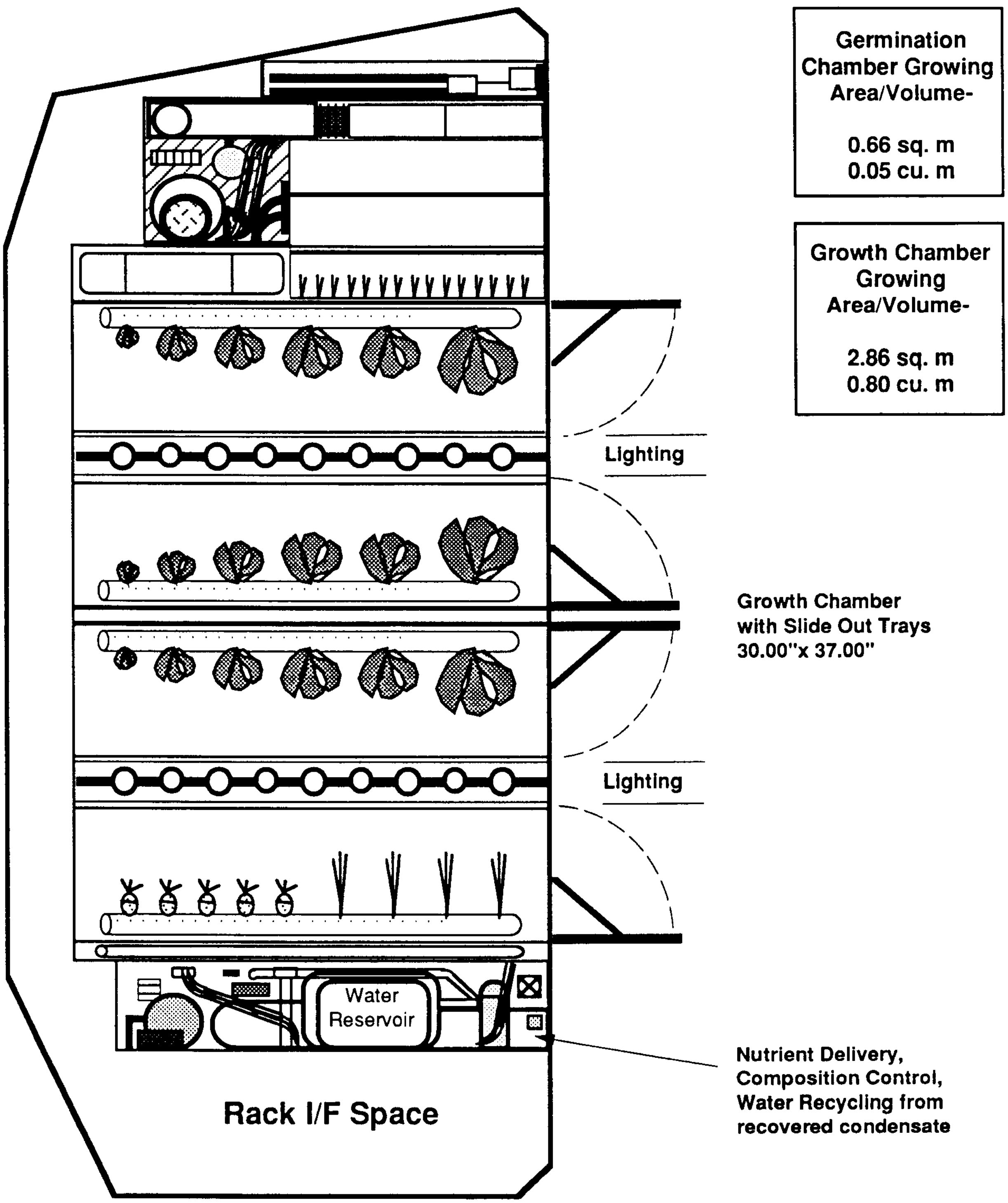
NOTE TO EDITORS/NEWS DIRECTORS: Still photographs and video are available to accompany this release, and may be obtained by calling the NASA Ames Public Information Office, (415) 604-9000.

SALAD MACHINE DESIGN CONCEPT

SECTION VIEW

Standard Station Rack
Configuration



Straight, Lisec, Borchers, Kliss

NASA News
National Aeronautics and
Space Administration
Ames Research Center
Dryden Flight Research Facility
P.O. Box 273
Edwards, California 93523
AC 805 258-8381

Sarah Keegan
Headquarters, Washington, D.C.
(Phone:202/453-2754)

Don Haley
Ames-Dryden Flight Research Facility
Edwards, Calif.
(Phone: 805/258-3456)

Feb. 5, 1991
(Simultaneously released
in Washington, D.C.)

RELEASE: 91-5

X-29 RESEARCH AIRCRAFT SETS FLIGHT RECORDS

The X-29 forward-swept-wing technology demonstrator has added two new records to its history at NASA's Ames-Dryden Flight Research Facility, Edwards, Calif.

The unconventional-looking aircraft flew five times on January 25 to set a one-day flight record at Ames-Dryden, NASA's premier flight research installation.

The X-29 also tied an existing weekly flight frequency mark when it chalked up nine missions during the week of January 21-25.

The X-29 has flown four times in one day several times, most recently on January 22. But until January 25, no research aircraft at Ames-Dryden had ever flown five times in a single day. The only other research aircraft to fly nine times in one week at the facility was the AFTI (Advanced Fighter Technology Integration) F-16 in July 1983.

A technology demonstrator aircraft, the X-29 is currently investigating the high angle-of-attack characteristics and military utility of its unique forward-swept-wing/canard design in a joint NASA/USAF program.

-more-

The program is producing excellent data that could be used in the design and development of future aircraft.

The nine recent X-29 flights were part of a program to collect data about the aircraft's handling and control characteristics at high "angles-of-attack," i.e., the angle of an aircraft's body and wings relative to its actual flight path.

The X-29 now being flown is the No. 2 aircraft. The first X-29 logged 242 flights between December 1984 and December 1988, most ever for a NASA research aircraft.

The No. 2 X-29 first flew in May 1989 and its record-setting fifth flight on January 25 was its 78th research mission.

On recent flights, the No. 2 X-29 has been flown at an angle of attack up to 67 degrees. It has demonstrated better control and maneuvering qualities in high-angle flight than computational methods and simulation models had predicted.

On future flights, the aircraft's maneuvering capability will be evaluated at high angles-of-attack while flying at speeds up to 250 knots (287 mph) in a joint NASA/Department of Defense study that is part of the overall X-29 research program.

The NASA X-29 project manager at Ames-Dryden is Gary Trippensee. The X-29 program is managed by the Air Force's Aeronautical Systems Division, Air Force Systems Command, Wright-Patterson AFB, Ohio.

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NASA News

National Aeronautics and
Space Administration
Ames Research Center
Dryden Flight Research Facility
P.O. Box 273
Edwards, California 93523
AC 805 258-8381

RELEASE NO. 91-6 March 6, 1991

Nancy Lovato
(805) 258-3449

NASA DRYDEN RESUMES TOURS

NASA's Ames-Dryden Flight Research Facility, Edwards, Calif., has resumed public tours. Tours had been cancelled during the Persian Gulf crisis.

Tours are held at 10:15 a.m. and 1:15 p.m. on weekdays, excluding federal holidays and shuttle landing days. They are by reservation and free of charge.

The tour consists of a film on NASA's current and past aeronautics projects and a walk through two airplane hangars. Aircraft that may be viewed include the forward-swept wing X-29, the SR-71, an F-15, the HL-10 lifting body, and F/A-18s, depending on availability. Past programs covered in the film include the famed X-15 rocket-powered spaceplane.

Groups of up to 50 persons can be accommodated. Individual tours will be scheduled on a first come, first serve basis. The Tour Office telephone number for scheduling or information is (805) 258-3460.

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Since the tour involves walking, visitors should wear comfortable shoes and be prepared for high temperatures in the summer. Occasionally, the walking portion may be cancelled due to inclement weather. Including the 24-minute film, tour duration is about an hour and 15 minutes.

The tour film is also available in VHS or 3/4-inch video format for organizations unable to visit Dryden.

-NASA-

NASA Facts

National Aeronautics and
Space Administration
Ames Research Center
Dryden Flight Research Facility
P.O. Box 273
Edwards, California 93523
AC 805 258-8381

Release No. 91-7 March 27, 1991

Don Haley
(805) 258-3456

SPACE SHUTTLE VIEWING SITE OPEN FOR NEXT LANDING

The East Shore Viewing Site at Edwards Air Force Base, Calif., where the public can watch space shuttle landings, will be open for the next flight -- weather and road conditions permitting.

The next space shuttle mission is STS-37. The launch window at the Kennedy Space Center in Florida opens April 5 at 6:18 a.m. (PST). The projected landing time for the shuttle Atlantis at Edwards on April 10 after the five-day mission is 7:29 a.m. (PDT), according to officials at the NASA Dryden Flight Research Facility there.

The East Shore Viewing Site will be open 24 hours in advance of the planned landing time, and reservations or parking permits are not required.

If rain makes access roads or the public viewing area on the edge of Rogers Dry Lake unsafe for vehicles, the public viewing site will not be opened.

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Water and restrooms are available at the East Shore Viewing Site. Recreational vehicles must be self-contained and there are no dumping facilities. Access to the viewing site is by secondary roads, and there may be congestion.

Seasonal temperatures at Edwards at this time of year often are near or below freezing, so visitors should dress accordingly.

Viewers should follow news reports for any possible change in the landing date or location. Up-to-date landing information can be obtained by calling (805) 258-3520.

There are two access routes to the East Shore site. Motorists entering the site from the Antelope Valley Freeway (Highway 14), will exit the freeway at the Avenue F off-ramp north of Lancaster. They will drive east one mile to Sierra Highway, turn left (north) on Sierra and travel to Avenue E where they turn right (east) and drive eastward to 140th Street. At 140th, turn left (north) and drive to Avenue B, and turn right (east). Avenue B becomes Mercury Boulevard, which leads into the viewing area on the northeast side of Rogers Dry Lake.

Shuttle viewers entering the site on the north side of Edwards from Highway 58 should leave the freeway at the Rocket Site Road exit. Rocket Site Road becomes Rich Road inside Edwards and intersects with Mercury Blvd. A right turn onto Mercury Boulevard will lead motorists into the viewing site.

Atlantis is currently scheduled to land on the main concrete runway at Edwards, which is about four miles from the East Shore Viewing Site.

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NASA News

National Aeronautics and
Space Administration
Ames Research Center
Dryden Flight Research Facility
P.O. Box 273
Edwards, California 93523
AC 805 258-8381

Release No. 91-9 April 16, 1991

Don Haley
(805) 258-3456

SPACE SHUTTLE VIEWING SITE OPEN FOR NEXT LANDING

The East Shore Viewing Site at Edwards Air Force Base, Calif., where the public can watch the space shuttle land will be open to the public for the next landing.

The next space shuttle mission is STS-39. The launch window at the Kennedy Space Center in Florida opens April 23 at 4:05 a.m. (PDT). The projected landing time for the shuttle Discovery at Edwards on May 1 after the eight-day mission is 11:34 a.m. (PDT), according to officials at the NASA Dryden Flight Research Facility there.

The East Shore Viewing Site will open 24 hours in advance of the planned landing time, and reservations or parking permits are not required.

Water and restrooms are available at the East Shore Viewing Site. Recreational vehicles must be self-contained and there are no dumping facilities. Access to the viewing site is by secondary roads, and there may be congestion.

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Discovery is currently scheduled to land on the main concrete runway at Edwards, which is about four miles from the East Shore Viewing Site.

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NASA News

National Aeronautics and
Space Administration

Ames Research Center
Dryden Flight Research Facility
P.O. Box 273
Edwards, California 93523
AC 805 258-8381

Release No. 91-10 May 15, 1991

Don Haley
(805) 258-3456

SPACE SHUTTLE VIEWING SITE OPEN FOR NEXT LANDING

The East Shore Viewing Site at Edwards Air Force Base, Calif., where the public can watch the space shuttle land, will be open to the public for the next landing.

The next space shuttle mission is STS-40, to be flown by the orbiter Columbia. The two-hour launch window at the Kennedy Space Center in Florida opens at 5 a.m. (PDT) May 22. Based on a launch at the opening of the window, the projected landing time at Edwards ending the nine-day mission would be 8:51 a.m. (PDT) May 31, according to officials at the NASA Dryden Flight Research Facility there.

The East Shore Viewing Site will open 24 hours in advance of the planned landing time, and reservations or parking permits are not required.

Water and restrooms are available at the East Shore Viewing Site. Recreational vehicles must be self-contained and there are no dumping facilities. Access to the viewing site is by secondary roads, and there may be congestion.

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Viewers should follow news reports for any possible change in the landing date or location. Up-to-date landing information can be obtained by calling (805) 258-3520.

There are two access routes to the East Shore site. Motorists entering the site from the Antelope Valley Freeway (Highway 14), will exit the freeway at the Avenue F off-ramp north of Lancaster. They will drive east one mile to Sierra Highway, turn left (north) on Sierra and travel to Avenue E where they turn right (east) and drive eastward to 140th Street. At 140th, turn left (north) and drive to Avenue B, and turn right (east). Avenue B becomes Mercury Boulevard, which leads into the viewing area on the northeast side of Rogers Dry Lake.

Shuttle viewers entering the site on the north side of Edwards from Highway 58 should leave the freeway at the Rocket Site Road exit. Rocket Site Road becomes Rich Road inside Edwards and intersects with Mercury Blvd. A right turn onto Mercury Boulevard will lead motorists into the viewing site.

If rain makes access roads or the public viewing area on the edge of Rogers Dry Lake unsafe for vehicles, the public viewing site will not be opened.

Columbia is currently scheduled to land on the main concrete runway at Edwards, which is about four miles from the East Shore Viewing Site.

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NASA News

National Aeronautics and
Space Administration

Ames Research Center
Dryden Flight Research Facility
P.O. Box 273
Edwards, California 93523
AC 805 258-8381

Don Haley
Dryden Flight Research Facility, Edwards, Calif.
(805) 258-3456

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NATIONAL AEROSPACE PLANE TEST ARTICLE ARRIVES AT DRYDEN

The first full-scale X-30 carbon-carbon structural component to undergo loads and temperature testing by NASA has arrived at Dryden's Thermostructures Research Facility where it will be subjected to temperatures in excess of 2000 degrees (F) before testing for the X-30 program is completed at Dryden in 1993.

The test article is part of a full-scale wing control surface based on a generic X-30 design. Patterned after an elevon, it was designed and built by the Missile Division of LTV Corp., Grand Prairie, Texas., under contract to NASA's Langley Research Center, Hampton, Va.

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earth orbit while operating from a conventional runway. Data from the program would be used to help develop future low-cost aircraft with advanced atmospheric and space flight capabilities.

Formal government approval to build the X-30s is expected in 1993. Flight testing would begin at Dryden and Edwards in 1997.

Instrumentation of the test article with strain gages will begin next month in preparation for mechanical loads testing set for this fall, according to V. Michael DeAngelis, chief of Dryden's Aerostructures Branch.

Following up to four months of mechanical loads tests, which will verify the component's ability to withstand loads similar to those of atmospheric flight, the advanced heat-resistant non-metallic materiel will then be prepared for thermal testing set to begin in the fall of 1992. Initial tests will be limited to state-of-the-art foil strain gage measurement capabilities on carbon-carbon -- about 400 degrees (F). DeAngelis said the goal of the test program is to eventually achieve test temperatures as high as 3000 degrees (F) by the time the Dryden test program ends, which could be extended into 1995 or 1996.

Lead test engineer on the NASP component is Roger A. Fields, who has been at Dryden since 1963. Considered one of the leading thermostructures test engineers in the U.S., Fields has worked on most all major thermal structures test projects at Dryden, including the X-15 and YF-12 aircraft, the hypersonic wing test structure, and the space shuttle elevon seals tests. Fields also conducted the more recent tests of titanium alloy and titanium matrix composite buckling-critical panels for the NASP program.

The NASP mission profile demands much greater performance from its structures and materials than do space shuttle orbiters because the NASP must accelerate at low altitude within the atmosphere to reach orbit resulting in extensive aerodynamic heating of the aircraft's structure. The shuttles climb out of the atmosphere quickly, minimizing this aerodynamic heating. Engineers expect that the X-30 will experience structural loads at extreme temperatures and sustained high temperatures not just during atmospheric reentry but also during supersonic and hypersonic cruise and ascent.

LTV's successful fabrication of the somewhat stiff composite represents a major milestone in materials technology development.

"The fabrication was challenging," said Dr. Wayne Sawyer, of Langley's Structural Mechanics Division. "It is a big part that requires a series of fairly high-temperature thermal cycles in the fabrication process. Just being able to make a large part or several big parts that will fit together is very tough and requires good control of the tolerances and the fabrication process."

The rib-stiffened NASA component is about 56 inches long, 39 inches wide, and 14 inches thick at the leading edge and 6 inches thick at the trailing edge. Elevons carry out the dual function of elevators and ailerons for pitch and roll control. They are used on the space shuttles and several types of aircraft, and will be used on the X-30, which will feature a modified lifting body configuration.

The torque tube, to which the flight-weight component is mounted, is being instrumented at Langley and will be shipped to Dryden in time for the first tests in September. It is also made of carbon-carbon.

"To our knowledge the component is made of some of the most complicated carbon-carbon parts ever fabricated," said Dr. Don Rummler, also of Langley's Structural Mechanics Division.

The need for a load-bearing tube with multiple layers and many holes and cutouts complicated the fabrication task. Even fasteners had to be made of carbon carbon to withstand the high temperatures.

The component parts were heated to high temperatures several times and densified to increase strength, in a process likened to "burning toast." Strength went up with each processing cycle, as epoxy-like material was used to densify the materiel by filling tiny voids in the carbon matrix -- up to 42 layers or plies thick -- between heat treatments. A final coating protected exterior surfaces against oxidation.

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NASA News

National Aeronautics and
Space Administration
Ames Research Center
Dryden Flight Research Facility
P.O. Box 273
Edwards, California 93523
AC 805 258-8381

Ken Atchison
Headquarters, Washington, D.C.
(Phone: 202/453-2754)

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Don Haley
Dryden Flight Research Facility, Edwards, Calif.
(Phone: 805/258-3456)

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NASA STUDY PAVES WAY FOR CONTROL OF CRIPPLED AIRCRAFT

A massive hydraulic failure disables the flight controls of an airplane miles from the nearest airport. Is a crash landing inevitable?

Not necessarily. An engineering study at NASA's Dryden Flight Research Facility, Edwards, Calif., shows that multi-engine aircraft with specially programmed flight control systems can touch down safely using just the engines to turn and land.

NASA's study resulted from several recent incidents in which the hydraulic control systems on large aircraft failed during flight. The pilots were left with little or no capability to land normally -- using the aircraft's ailerons, rudder and elevators.

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Engineers are doing the work on a simulator programmed to look at the engine-only handling and flying qualities of a variety of aircraft, including large transports and a twin-engine jet fighter.

According to Frank W. Burcham, Chief of Dryden's Propulsion and Performance Branch and the study's initiator, the next major step will be to modify the digital flight control system in NASA's F-15 research aircraft for proof-of-concept flights. The flight program, to be done in cooperation with the U.S. Air Force, could take place within the next 18 to 24 months, pending formal approval.

The system tested at Dryden is solely for research, and not intended for operational use on existing aircraft. Data from current and future phases of the studies will be available to the aircraft industry for possible application to commercial and military planes.

Disastrous flight control system failures are rare in commercial aviation, said Burcham, "but if you can save just one aircraft every 10 years, the system is worth it."

Burcham explained that the augmented flight control system on a disabled aircraft would take the pilot's stick inputs and convert them into engine throttle commands. The flight control system would automatically program the engines to turn the aircraft, climb and descend, and eventually land safely by varying the speed of the engines individually or collectively.

In the Dryden study, the engineer-pilot research team used the simulator to compare handling and control characteristics of a four-engine jet transport and the NASA F-15. They "flew" the aircraft in both the augmented mode and with manual engine control using hand throttles.

The comparative study showed both types of aircraft can be controlled somewhat by manual engine control during level flight and benign maneuvers, but they are extremely difficult to land. In the augmented mode, safe flight and landings are possible even in air turbulence and crosswinds.

Preliminary flight evaluations by NASA pilots in the F-15 and in two business-size aircraft (a twin jet and a twin propeller) verified simulator predictions that some control is possible using just the hand throttles. But landing tasks are extremely difficult unless the flight control system has been tailored for engine control.

The engine-control idea is limited to multi-engine aircraft with electronic engine and flight control systems. It can be applied to either jet or propeller-driven aircraft.

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NASA News

National Aeronautics and
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Washington, D.C. 20546
AC 202 453-8400

For Release

Donald G. James
NASA Headquarters, Washington, D.C.
(Phone: 202/453-2754)

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Del Harding
Ames Research Center, Moffett Field, Calif.
(Phone: 415/604-9000)

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FULL-SCALE AIRCRAFT TESTED IN WORLD'S LARGEST WIND TUNNEL

Tests are underway on an F/A-18 fighter aircraft in the 80-by-120-foot wind tunnel at NASA's Ames Research Center, Moffett Field, Calif., making it the first full-scale aircraft to face the winds in the world's largest wind tunnel.

The 135,000 horsepower motors that turn the tunnel's six fan drives roared to life beginning a series of investigations designed, among other things, to understand how a modern fighter like the F/A-18 performs at high angles of attack, or "high alpha."

Angle of attack is the tilt of a plane's body and wings relative to the wind. The pilot's ability to control the plane in high-alpha flight is an advantage in some aerial combat scenarios. The wind tunnel tests are part of NASA's High Alpha Technology Program, a cooperative research program at NASA's Ames, Langley and Lewis Research Centers.

"The High Alpha Technology Program is a comprehensive program which integrates supercomputer technology, ground-based experiments and flight tests of a specially equipped F/A-18 fighter. This is an ambitious effort to improve the maneuverability of high performance military aircraft at very high angles of attack," said Ames high alpha program coordinator Dr. Lewis Schiff.

"The high-alpha regime poses a unique and difficult challenge to our understanding of aerodynamics. Our goal," Schiff said, "is to develop advanced design methods which can accurately predict the behavior of an aircraft maneuvering in this regime."

The wind tunnel test is conducted in the 80-by-120-foot test section of Ames' National Full-Scale Aerodynamics Complex (NFAC). The tests are scheduled to run 12 weeks, with a second entry planned next year. The U.S. Navy, through the Naval Air Systems Command, supplied the F/A-18 aircraft to NASA.

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"NASA's aeronautics research is based on the philosophy of 'Computation to Flight' where the most effective tools are put to use as a team to increase our understanding of aerodynamics," said Schiff.

These tools include supercomputers and the science discipline known as Computational Fluid Dynamics (CFD), wind tunnels and flight simulators (ground-based facilities), and research aircraft tests. CFD, as applied to aeronautics, is the science of calculating the behavior of air ("fluid") flow around an aircraft. The power of supercomputers coupled with super workstations allow for three-dimensional graphic illustration of the computed air flow, giving researchers better overall understanding of the flow structures and interactions.

There are four objectives of the NFAC tests: correlating the wind tunnel results with data obtained from small-scale wind tunnel tests and actual F/A-18 flight tests on a specially instrumented F/A-18 called the High Alpha Research Vehicle and CFD analysis; developing a data base from tests on forebody flow control devices; studying buffeting experienced by twin-tail fighters; and investigating the aerodynamic differences between the F/A-18 A and C versions.

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Photos and a backgrounder on The High Alpha Technology Program are available from Ames Research Center, (415/604-9000)